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ON SOME FERNS FROM THE MALAY PENINSULA

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From Mr. R. E. Holttum, Director of the Botanic Gardens, Singapore, I have received in 1926 and 1927 two lots of duplicate specimens of ferns from the Peninsula. The specimens were of extraordinary interest to me, because I am now engaged in the determination of three very large collections of ferns from Borneo, in connection with a critical revision of the whole fern-flora of that large island, based on examination of type specimens received on loan from the leading herbaria in Europe and America. It soon became clear to me that the fern floras of Borneo and the Malay Peninsula are very intimately related, having a very large number of species in common. I found that some of the specimens from the Peninsula so kindly sent by Mr. Holttum were perfectly identical with others from Borneo, but in not a few cases different names were given to them.

In July 1926 Mr. H. N. Ridley published his large paper, "The Ferns of the Malay Peninsula" (*Journ. Malayan Branch, R. Asiatic Soc.*, 4, part 1), which work I have studied with considerable interest. It appears that Mr. Ridley has identified the great majority of his specimens at Kew, and has in several cases without criticism adopted Beddome's species. All modern pteridologists agree in taking the species in a narrower sense than Baker and Beddome, and to me several of Ridley's species are an assemblage of a number of most distinct forms. On the other hand he has adopted some of the species recently described by van Alderwerelt van Rosenburgh, who has described an immense number of new species which are scarcely all well founded, and not rarely identical with species previously described. Unfortunately a large number of his new species are not represented by authentic specimens in European herbaria, even not in Leiden, and without examination of such specimens it is in most cases rather impossible to know whether his species are valid ones or not.

As a certain number of the species adopted by Mr. Ridley were unknown to me, and others seemed to be wrongly

named, I asked Mr. Holttum to send me on loan specimens of those species from the Singapore Botanic Gardens Herbarium, and very kindly he did so.

Having thus had specimens of most species enumerated in Mr. Ridley's list, and having compared them with an immense quantity of material from Borneo and with numerous type specimens, I have been able to verify the determinations, or in several cases give the species their right names. In the present paper a part of my critical remarks are published. It contains descriptions of a couple of new species, the first record of several species for the Peninsula, and a revision of some groups of closely related species.

Copenhagen, March 4th, 1928.

Hymenophyllum productum Kunze, Bot. Zeit., 1848, 305; v. d. Bosch, Hym. Jav., 56, pl. 45.

H. demissum Ridley p. 12 (pro parte?).

PERAK: Taiping Hill (Burkill 12836). PAHANG: G. Kajang, P. Tioman (Henderson 18604).

The distinct species has by most authors been considered a "form" of the Australian *H. demissum*; it differs from that species by its smaller size, more open habit and especially by the slightly but distinctly crenately toothed tips of the indusium valves. It is apparently a common species through the Malayan region.

Hymenophyllum semifissum Copeland, Philipp. Journ. Sci., 10 C, 145. 1915.

JOHORE: Gunong Panti (Holttum 18066).

Determined rightly by Mr. Holttum. The species, previously known from Borneo only, seems to be very distinct by its subdimidiate pinnae with long linear entire secondary segments, by the few but long brown hairs on the rachis and the subtrichomanoid sori, the indusia cut half-way down only with two acute valves and a long exserted receptacle. It seems to be rather common in Sarawak, and may be confounded with two other species also common there, viz. *H. Bakeri* Copel. (*Trichomanes denticulatum* Bak.) and *H. microchilum* (Bak.) C. Chr. comb. nov. (*Trichomanes* Bak.). The former differs by the serrated segments, the latter especially by the indusia very slightly cleft with two small valves and lack of hairs. Both were referred by Baker to *Trichomanes*, but the whole habit agrees much better with *Hymenophyllum*; within this genus the three species form a special little group. The two Bornean species probably occur also in the Peninsula.

Hymenophyllum tunbridgense (L.) Sm.

To this species Ridley (p. 13) refers two specimens, not seen by me; a third from Pahang (Henderson 18275) and so named by Holttum is certainly not *H. tunbridgense*, but a form of the very variable *H. holochilum*, near var. *affine*

(v. d. B.). I do not believe that the true *H. tunbridgense* occurs in the Malayan region.

Trichomanes sublimbatum K. Muell.

Specimens from Singapore (Bukit Timah), leg. Holttum (10481) and by him named *T. sublimbatum*, agree with the specimen from the same locality (Ridley 6684) which Ridley, p. 15, referred to *T. Henzaianum* Parish. It is a proportionally large form (leaves 2-3 cm. long), deeply pinnatifid with about 4 linear oblong lobes on each side, in habit recalling the American *T. montanum* Hook. Spurious veins many, as in *T. sublimbatum* (cf. v. d. Bosch: Hym. Jav. pl.2) but connected by an intramarginal continuous spurious vein, which is not found in the genuine *T. sublimbatum*. The determination is therefore not certain, but it is not, I think, *T. Henzaianum* Parish, known by me from Hooker's illustration (Cent. pl. 1) and certainly it is not a variety of *T. Motleyi*, as suggested by Ridley. Holttum's collection (no. 10481) contains several smaller fronds which no doubt are typical *T. sublimbatum* with entire or slightly lobed blades, without intramarginal vein, and mixed with them several others of the larger, pinnatifid form. It is probable that these two forms are states of one species, and may possibly be formed on the same rhizome, which I have not, however, observed, so I am not sure. If this hypothesis is wrong, I should be inclined to consider the larger, pinnatifid form an undescribed species. I have it also from Sumatra and Borneo.

Trichomanes humile Forst., Prod., 84.

Crepidomanes humile v. d. Bosch, Hym. Jav., 16, pl. 11.

Trichomanes pyxidiferum pro parte, Ridley, p. 18.

SINGAPORE: Bukit Timah (Holttum 10482).

Easily distinguished from *T. bipunctatum* and the two following species by the presence of a marginal spurious vein, and by its thin texture.

Trichomanes brevipes (Pr.) Baker, Syn. Fil., 84. 1867.

Didymoglossum brevipes Presl, Hymenoph., 23, 47. 1843.

Trichomanes melanorhizon Hook., Spec., 1, 140. 1846. Ic. Plant., pl. 705.

Trichomanes recedens Rosenstock, Meded. Rijks Herb. Leiden, no. 11, 2. 1912.

Trichomanes microlirion Copeland, Philipp. Journ. Sci., 10 C, 146. 1915.

Trichomanes pyxidiferum pro parte, Ridley, p. 18.

SINGAPORE: (Ridley.) JOHORE: (Ridley 13473).

A beautiful series of specimens from Borneo, with which these from the Malay Peninsula fully agree, have convinced me that *T. brevipes* is a distinct species, different

from *T. bilabiatum*, to which it has been referred (see Ind. Fil.) and therefore forgotten and in recent time redescribed as a new species by Rosenstock and Copeland. It differs from *T. bilabiatum* by its light green colour, by the presence of several short reddish hairs on rachis and ribs beneath, by the short spurious veins in the parenchyma within the submarginal one being very few or none, by the sori being confined to the axils of the uppermost pinnae, which often are very much reduced so that the sori sometimes form a spike at the top of the frond, and by the valves of the indusia being short, rounded, and at maturity reflexed. *T. pyxidiferum* Ridley is partly this species, partly probably *T. bilabiatum* and *T. humile*. The genuine *T. pyxidiferum* L. is a West Indian species not found in the Old World.

Trichomanes bilabiatum Nees et Bl., Nova Acta, 11, 123, Pl. 13, fig. 2. 1823.

Didymoglossum laxum v. d. Bosch, Hym. Jav., 37, pl. 27.

I have seen no specimen of this species from the Malay Peninsula, but as it occurs in most of the Malayan Islands it certainly also may be found in the Peninsula. In habit it resembles the former species; it is dark green, not so conspicuously hairy, spurious short veins in the parenchyma numerous, and the sori not confined to the axils of the upper pinnae, several of the outer segments being often soriferous, the valves of the indusium longer.

Trichomanes setaceum v. d. Bosch, Nederl. Kruidk. Arch., 5 (2), 176. 1861.

Tr. setigerum Backh., Cat. 14. 1861 (not seen). Moore, Gard. Chron., 1862, 45, sp. auth., Kew!

Tr. parviflorum auctt.; Ridley 20, not Poir.

Most specimens from Tropical Asia hitherto named *T. parviflorum* (or *T. faeniculaceum* Bory) belong, I think, to *T. setaceum* v. d. B. described from a specimen from Singapore. It seems to be common in Borneo and may easily be known from the other species of the section *Leptomanes* by the ultimate filiform segments being connate below, forming an undivided basal portion of the ultimate pinnules. The true *T. parviflorum* from the Mascarene Islands has, as *T. pluma* and *T. meifolium*, the ultimate pinnules cut to the midrib into filiform, terete segments, the midribs of which are bordered by 1-3 rows of clear parenchymatous cells, much as in *T. gemmatum*. The only specimen by Ridley referred *T. parviflorum* (leg. Murton) is to me *T. setaceum*. He cites this name as a synonym of *T. cupressoides* Desv., which differs by its somewhat crisped fronds and the secondary pinnules not being dissolved into filiform segments, the ultimate veins being connate nearly to the apex.

Alsophila Burbidgei Baker, Journ. Bot., 1879, 38.

? *A. trichodesma* Scort., Bedd., Journ. Bot., 1887, 321.

Cyathea mollis Copel., Philipp. Journ. Sci., 12 C, 52. 1917.

PERAK: Bujang Malacca (Herb. Bot. Gard. Singapore, probably coll. Wray, s. n.; *A. trichodesma*). NEGRI SEMBILAN: Bukit Tangga (Md. Nur, 11830).

The name *A. Burbidgei* was applied by Bishop Hose and Dr. Christ to a Bornean species, which differs from the true *A. Burbidgei*, from Sarawak (Burbidge, Kew!) by the densely squamose stipe and rachis; it is, I believe, very nearly the same as *A. Margarethae* Schwet. These large tree ferns are usually very difficult to identify because most material in the herbaria is fragmentary; this is the case with the type specimens of *A. Burbidgei* and *A. Margarethae* (Herb. Bonaparte, Paris).

The genuine *A. Burbidgei*, of which the stipe is unknown to me, is a rather thin-leaved species with dark brown or atropurpureous main rachis which shows no traces of scales but is minutely scabrous from fallen hairs, above densely and adpressedly pubescent. All its ribs beneath densely hirsute by patent, rather soft, pluricellular hairs, the costules with some few lanceolate brown scales and the midribs of segments with a few whitish bullate scales beneath. The pinnules are very shortly petiolulate, the segments subentire or crenate; sporangia mixed with some long hairs.

The specimen from Negri Sembilan resembles very closely Baker's type, and the specimen from Perak, supposed to be *A. trichodesma* Scort. is very nearly the same; its rachis is lighter and still pubescent beneath, the pinnules sessile, the segments distinctly crenately toothed, the hairs stiffer, cylindrical, subulate, distinctly septate, very much like those of *A. margarethae*, but all these differences seem scarcely sufficient for the segregation of this form as a distinct species. According to Beddome its stipe is scaly at base only. *Cyathea mollis* Copel. from British North Borneo (Sandakan, Mrs. Clemens 9440, Herb. Copeland!) is, I firmly believe, a less pubescent form of the same species.

***Dryopteris pectiniformis* n. sp.**

Lastrea. Rhizome probably erect. Stipe stramineous, shortly puberulous. Lamina ovate-elongate, acuminate, herbaceous, 45 cm. long, 22 cm. wide, bipinnatifid. Rachis densely but very shortly pubescent. Pinnae about 20 pairs, sessile, the lower opposite, the upper alternate, acuminate, the lower not reduced, the largest 11 cm. long, 1.8 cm. wide, at distances of about 3.5 cm., patent, very regularly pectinato-pinnatifid to a wing 1 mm. broad. Segments a little oblique, separated by narrow sinuses, the basal ones of lower

pinnae reduced, the upper basal one of upper pinnae somewhat enlarged, medial ones oblong, acute, entire, 2mm. broad Costae densely grayhairy on both sides, midribs and veins sparsely pubescent, the underside densely glandular with red, shining glands. Veins 7-8 jugate, simple. Sori medial or a little inframedial, indusia large, rufous, persistent, glabrous.

PERAK: without definite locality, leg. Bishop Hose. (Type in Herb. Roland Bonaparte, Mus. d'Hist. Nat. Paris).

The specimen was distributed as *Nephrodium gracilescens*, and it was probably collected in the Taiping Hills; other specimens from the same collection (Hose 293 ?) were referred to that species by Ridley, p. 64. It differs from *D. gracilescens* by larger size, finely glandular underside, more densely and more shortly pubescent rachis and costae, the large rufous-brown indusia, etc. The true *D. gracilescens* (Bl.) from Java is eglandulose, has obtuse segments, supramedial sori, and is as a whole much smaller. A specimen from Perak, leg. Scortechini, referred by Ridley to *D. gracilescens*, belongs rather to *D. pectiniformis*, agreeing with the type in the acute segments and large indusia, but it is without glands.

Dryopteris viscosa (J. Sm.) O. Kze.; C. Chr., Index.

Lastrea viscosa J. Sm., Ridley 65.

Nephrodium gymnopodium Baker, Trans. Linn. Soc., II S, Bot., 4, 252.

Dryopteris gymnopoda C. Chr., Index.

Lastrea Ridleyi Bedd., Kew Bull., 1909, 423. Ridley 65.

Dryopteris Ridleyi C. Chr., Ind. Suppl., 38, 1913.

Dryopteris athyriocarpa Copeland, Philipp. Journ. Sci., 3 C, 344. 1909.

Dryopteris kinabaluensis Copel., l. c., 12 C, 55. 1917.

Having seen the type specimens of all these "species" described as new in recent time, I am fully convinced that they all must be referred to the old *D. viscosa*. They are all fully identical as to all important characters; the dark stipe, dark colour, more or less glandular surfaces, the reflexed basal pinnae, venation, etc., varying somewhat in indusium-characters and density of the glands. These are as a rule dark-brown, like drops of gum, and may be found on both surfaces, but evidently they soon dry out and are then scarcely perceptible. The indusia are generally persistent, reniform or sub-hippocrepiform with a deep sinus, rarely small as in a cotype specimen of *L. Ridleyi* Bedd. (Ridley 7849), which was described as exindusiate; it is identical with *N. gymnopodium* Bak. from Mt. Kinabalu, British N. Borneo (Haviland 1486, Kew!). *D. kinabaluensis* Copel. from the same mountain (Topping 1719, Herb.

Copeland!) is quite the same. *D. athyriocarpa* Copel. from Sarawak, Bongo Range (Brooks and Hewitt, Herb. Copeland!) is a somewhat different form, evidently common in Borneo, with subathyrioid indusia and the upper basal segment lobed. Other forms occur in Sumatra; the whole complex of forms is closely allied to *D. gracilescens*. Intimately allied to *D. viscosa* is

Dryopteris Robinsonii (Ridley) C. Chr. comb. nov.

Lastrea Robinsoni Ridley, 65.

In general habit and colour it does not differ from *L. viscosa*, but its pubescence is peculiar and it seems to be distinct. The whole leaf is densely glanduloso-pubescent with short hairs, those of the rachis and costae longer and reddish. The surfaces are densely dotted with small whitish spots, probably glands, that are dried out.

Dryopteris crassifolia (Bl.) O. Kze, and related species.

D. crassifolia is, as interpreted in Syn. Fil., by Beddome and Ridley a composite species, including several distinct forms, which I consider good species. In the large collections of Bornean ferns examined by me I find six or seven species pertaining to this group, which presumably also occur in the Malay Peninsula. This narrow group represents the American subgenus *Steiopteris* in Malaya, but is probably not genetically related to it. All species are very uniform in several characters, by which they differ essentially from all other species of the genus. The fronds are more or less coriaceous, when dried of a characteristic brown colour, the lower pinnae distinctly stalked, the veins simple and the basal ones connivent to the sinus, not truly united; in most species an intermittent vein runs from the costa between two segments to the sinus. It is a true vein, not a carinate fold as found in *Steiopteris*. Indusia generally large, but easily rubbed off. Rhizome (of all species?) creeping, the lamina not narrowed below, often terminating in a subdistinct pinnatifid end-pinna, yet not imparipinnate. To this group must naturally be joined some few species that differ from *D. crassifolia* and its immediate allies by the densely scaly stipe and lower part of rachis. All these species at present known to me may be distinguished by the following key:

1. Stipe naked or scaly near base only; rachis without scales or practically so - - - - 2
 Stipe and lower part of rachis densely scaly with linear castaneous scales, or woolly - - - 6
2. Leaf papyraceous or chartaceous. Pinnae about 2 cm. or less wide, deeply incised to a wing to the costa 1—2 mm. wide, the segments under 3 mm. in width; the

- posterior basal vein springs out from the midrib or from the costa close to the axil of the midrib, reaching the edge just above the bottom of the sinus, to which the opposite anterior vein runs - 3
- Leaf rigidly coriaceous. Pinnæ 2—4 cm. wide, incised $\frac{1}{2}$ to $\frac{2}{3}$ of the way to the midrib, the segments 5—10 mm. broad; the posterior basal vein springs out from the costa 1—5 mm. from the base of the midrib, often midway between two midribs, and running straight to the sinus, below which it is connivent with the opposite anterior vein - - - 5
3. Leaves small, rarely 25 cm. long including the stipe, 4 cm. wide. often much smaller - - - *D. Teuscheri*
Leaves much larger, 50—100 cm. v. A. v. R.
long, 25 cm. wide - - - 4
4. Leaf brown when dried; lower pinnae short-stalked (stalks 1—2 mm.); rachis and costae beneath shortly pubescent and furnished with scattered linear brown scales; edges of segments distinctly thickened - - - *D. chlamydophora*
Leaf grey-green when dried; Ros.
lower pinnae on stalks 1—1.5 cm. long; leaf practically glabrous throughout, at best thickly puberulous on rachis above and on costae; scales few or none - *D. Beccariana*
(Ces.) C. Chr.
5. Sori subcostular or at least distinctly inframedial; costae without scales beneath (?); pinnae incised $\frac{3}{4}$ of the way down, the costal wing at best 5 mm. broad; segments 5—7 mm. broad, falcate *D. crassifolia*
(Bl.) O. Kze.
Sori medial, sometimes supra-medial; costae slightly scaly beneath; pinnae incised about $\frac{1}{2}$ way, the costal wing 8—10 mm. broad; segments 8—10 mm. broad *D. Motleyana*
(Hook.) C. Chr.
6. Pinnæ scarcely 2 cm. broad; basal veins both running from the base of the midribs to the sinus; costae

- and veins beneath short-hairy;
indusia persistent - - - *D. echinata*
Pinnae 2—4 cm. broad; posterior
basal vein springing out from the
costa and meeting the opposite
anterior one below the sinus - 7
(Mett.) O. Kze.
7. Costae above broadly sulcate with
the edges of the furrow densely
bearded with brownish patent
hairs; leaf coriaceous, brownish
when dried - - - - 8
Costae above narrowly sulcate
antrorsely strigose with shorter
or longer hairs; leaf subcoriaceous
or rather thin, grey-green - *D. trichopoda*
C. Chr.
8. Costae and veins beneath sparsely
pubescent; indusia small or none
(?); rachis scaly in the lower
part only - - - - *D. Hallieri*
(Christ) C. Chr.
- Costae and veins densely villous;
indusia persistent, hirsute; rachis
scaly throughout - - - - *D. paleata* Copel.

Dryopteris Teuscheri v. A. v. R., Bull. Dept. Agric. Ind.
Néerl., 18, 6. 1908. Mal. Ferns, 183.

To this species, known to me from description only, I refer some specimens from Borneo and Sumatra which differ from the other species of the group by their small size. The largest leaf seen is 25 cm. long by 7 cm. wide, the stipe excluded, others much smaller, 10 cm. long by 2 cm. wide, chartaceous, brownish when dried, glossy above, finely downy and glandular beneath; rachis brownish, quadrangular, rather densely and long-hairy above, glabrous beneath; pinnae alternate, distinctly petiolate, (petioles 0.5—1 mm. long) the basal ones somewhat reduced and often reflexed, the medial ones the largest, 4 cm. long, 1 cm. wide, of small leaves 1—2 cm. long, 3—6 mm. wide, below the short entire obtuse or acute apex, cut down to a wing 1 mm. broad; upper pinnae sessile subentire. Segments oblique, oblong, obtuse, parallel, entire, 1—1.5 mm. broad, the basal ones of lower pinnae much reduced, the upper one free, 1 mm. long and broad, the lower one often quite obsolete. Veins free, simple, about 6-jugate, the anterior basal one running to the sinus, the posterior reaching the edge just above the bottom of the sinus. Sori medial, slightly impressed; indusia persistent, reniform, brown, glabrous (hairy, t. v. A. v. R.). Sarawak: Mt Matang (J. Hewitt 1908, Herb. Copeland); Bongo Range (C. J. Brooks 13, Herb. Copeland, Herb. C. Chr.). Sumatra: (J. Winkler 51).

In size and general habit this new species resembles small forms of *D. gracilescens*, but several important characters, as colour, texture, venation, indusia, show that its

nearest relative is *D. Beccariana*, and I referred my first specimens to that species, but the better specimens in herb. Copeland have, I believe, justified its segregation as a distinct species, especially differing from *D. Beccariana* by its much smaller size, short-tipped pinnae, and the rachis being rather longhairy above. I have seen no specimens of this species from the Malay Peninsula, where it very likely occurs. The specimens referred here are not quite identical; that from Sumatra is glandular and hairy beneath, as described by v. A. v. R.; those from Borneo without glands and glabrous beneath. The type was collected in Borneo.

Dryopteris Beccariana (Cesati) C. Chr., Index 254.

Nephrodium Beccarianum Cesati, Atti Acad. Napoli, 7, part 8, 23, 1876.

Beautiful specimens of this hitherto badly known species were collected by Dr. E. Mjöberg on Mt. Matang, Sarawak, which are fully identical with a fragment of the type, leg. Beccari (Kew!). In most characters it agrees with *D. Teuscheri*, but it is much larger. Stipe up to 50 cm. long, at base with many lanceolate castaneous scales, lamina 40-50 cm. long, 15-25 cm. broad, grey-green, papyraceous, practically glabrous and naked throughout (some minute hairs may be found on the upper part of the stramineous rachis and on the costae beneath). Most pinnae long-stalked (stalks 1-1.5 cm. long) terminating in long subentire caudate apex, incised to a wing 1.5-2 mm. broad, segments parallel, entire, oblique or subfalcate, subacute, about 3 mm. broad (those of the sterile leaf a little wider), the basal ones of lower pinnae much reduced or both fully obsolete, then the pinnae shortly cuneate at base. Veins about 12-jugate, simple, the basal ones running like those of *D. brunnescens*. Sori inframedial, indusia large, coriaceous, rufous or deep brown, glabrous, easily rubbed off.

SARAWAK: Mt. Matang (Beccari, Kew! E. Mjöberg, Herb. C. Chr.)

NEGRI SEMBILAN: Gunong Angsi, 1200 ft. (E. S. & G. Hose 4813, received from Kew). The latter specimen differs a little from the type by the sori being close to the midrib.

Dryopteris chlamydophora Rosenstock, Meded. Rijks Herb. Leiden, no. 31,5. 1917.

Lastrea nephrodioides Bedd., F. B. I., pl. 199 (not Moore).

Closely resembling *D. Beccariana* in size, texture, cutting and venation, but brown when dried. It differs by the rachis and costae and veins beneath being shortly pubescent and furnished with several linear brown scales, the underside being somewhat glandular, and by the much shorter 2-4 mm. long petioles of the lower pinnae; largest pinnae 20 cm. long, 2 cm. wide, the margins distinctly thickened,

the upper ones truncate-subcordate at base; veins 10-12 jugate; sori inframedial with large red indusia; sporangia mixed with shining red glands.

BORNEO: (Korthals, type in Leiden!); Sarawak, top of Mt. Poi (E. Mjöberg. Herb. C. Chr.).

MALAY PENINSULA: JOHORE, G. Panti (Holtum 18089); without definite locality, Kew distr. 738 (Herb. Copenhagen).

Most specimens quoted have been named *D. crassifolia*; they differ essentially from that species by much thinner texture, venation and glands. *Lastrea nephrodioides* Bedd., from Burma, referred by the author himself to *L. crassifolia* (Handb. 238) is according to description and illustration a more hairy form of *D. chlamydophora*; the name *nephrodioides* is not available in the genus.

Dryopteris crassifolia (Bl.) O. Kze.; C. Chr., Ind. 258.

Lastrea lata J. Sm., Hook. Journ. Bot., 3, 412.

The true *D. crassifolia* is, according to a cotype specimen from Java, leg. Blume, a much more rigid plant than the three former species, and with different venation owing to the pinnae being less deeply lobed as noted in the key above; the edge of the falcate segments is distinctly thickened; veins about 10-jugate; costae shortly strigose above, rather densely whitish-pubescent beneath with short crisped hairs and furnished with some brown scales towards the base, surfaces otherwise glabrous. Sori near the midrib, indusia apparently smaller and less coriaceous than in the former species.

This species is probably distributed through the whole Malayan region, but its area cannot now be determined with certainty, because most specimens so named appear to belong to other species. *Lastrea lata* J. Sm. from Luzon (Cuming 266) agrees closely with Blume's type, and a specimen from Perak (G. Hijau, Burkill 12588) is as to most characters typical, differing somewhat by the 1-2 cm. long stalks of the pinnae; according to Mr. Holtum it falls under *Nephrodium brachyodon* Bedd., Handb. 281, which to me is nearly identical with *D. Motleyana*.

Dryopteris Motleyana (Hook.) C. Chr., Ind. 278.

Nephrodium Motleyanum Hook., Syn. Fil., 266 (sub *N. crassifolia*).

Nephrodium brachyodon Bedd., Ferns Brit. Ind., Suppl., pl. 379; Handb. 281; Ridley 74; not Hooker.

In colour, texture and pubescence very similar to *D. crassifolia*, from which it differs mainly by its less deeply cut pinnae and medial sori. Stipe about 50 cm. long, scaly at base, like the rachis greyish-brown and finely puberulous. Lamina ovate-lanceolate or ovate-deltoid, 40-50 cm. long, 15-20 cm. wide, the sterile ones somewhat larger, pinnate,

rather abruptly narrowed into a pinnatifid apex. Lateral pinnae in 10-15 pairs, short-stalked (petioles of the lower ones rarely 1 cm. long), 10-12 cm. long, 2-2.5 cm. broad, truncate at base, terminating in a 2-3 cm. long entire acuminate apex, incised $1\frac{1}{3}$ - $1\frac{1}{2}$ of the way to the midrib into falcate segments 5 mm. long and broad. Veins of fertile segments 8-9-jugate, the posterior basal one generally springing out from the costa just below the sinus, below which it meets the opposite anterior one; the following two veins run out to the edge close to the bottom of the sinus. Sori medial or a little supramedial, indusia small fugacious; receptacle with several globose glands. Costa whitish-puberulous beneath, and towards the base furnished with several linear, brown scales.

BORNEO: LABUAN (Motley, type, Kew!); SARAWAK, Mt. Merinjak (Native collector, Sarawak Museum 161); DUTCH BORNEO, G. Damoet (Hallier 557).

PERAK: Gunong Keledang (Ridley 9537).

D. Motleyana, as here understood, includes the Asiatic form, which English botanists wrongly have referred to the American *D. brachyodus* (Kze) O. Kze. This is quite another species with 3-4 pairs of veins joining a membrane below the sinus and with a distinct aerophore at the base of the pinnae; in my monograph of the genus *Dryopteris*, 1, p. 172, I have referred it to *D. glandulosa* (Desv.) C. Chr. (not the Asiatic *D. glandulosa*) as a variety. Beddome's figure of his *N. brachyodon* is as a whole good, but the venation is not shown quite correctly.

To *D. Motleyana* I provisionally refer the following form as a variety:

var. *dulitenses* n. var.

Pinnae in four subopposite pairs below a terminal one nearly conform with the lateral ones, the largest 15 cm. long, 4 cm. wide, the basal ones on stalks 1.5 cm. long, incised about $\frac{1}{2}$, the segments nearly 1 cm. broad, otherwise scarcely different from the type.

SARAWAK: Mt. Dulit (E. Mjoberg, Herb. C. Chr.).

The following species form a special group, well characterised by the strong stipe being densely covered with castaneous scales throughout, a character very rarely found within the genus *Dryopteris*. As to other characters, the species show a close affinity to the narrow group of *D. crassifolia*. Most species are known from a single collection, and it is probable that their number should be considerably reduced. They differ chiefly by the density of the pubescence, a character not always a good one, and it is not improbable that they will appear to be forms of a single species.

Dryopteris echinata (Mett.) O. Kze. C. Chr., Ind. 262.

Lamina firmly herbaceous, 70-80 cm. long, rather gradually attenuated into a pinnatifid apex. Pinnæ 15 cm. long, 1.5-2 cm. broad, the basal ones somewhat reduced and reflexed, incised to a wing about 2 mm. broad, the segments subfalcate, obtuse, parallel, 3 mm. broad; veins 9-10 jugate, the basal ones both running from the base of the midribs to the bottom of the sinus. Costae above deeply sulcate with the raised edges of the furrow rather densely antrorsely strigose, the upper side otherwise glabrous, the margins ciliate; costae and midribs beneath densely and shortly pubescent with whitish, patent hairs, the veins and leaf-tissue thinly downy or almost glabrous. Sori inframedial, indusia persistent, brown, white-setose.

BORNEO: (Korthals!), and several other specimens.

Dryopteris Hallieri (Christ) C. Chr., Ind. 269.

Intermediate between *D. echinata* and *D. trichopoda*, resembling the former in pubescence, the latter in texture. The sessile pinnæ are 15-20 cm. long, 3 cm. broad, incised to a wing 4 mm. broad, coriaceous, brown, their costae broadly sulcate above, densely bearded by patent brownish hairs; costae and veins beneath pubescent with whitish needle-like shorter and longer hairs. Veins raised below, 10-11 jugate, the posterior basal one springing out from the costa about 1 mm. from the midrib and meeting the opposite anterior one a little below the sinus. Sori inframedial; indusia all rubber off.

DUTCH BORNEO: Amai Ambit (Hallier 3204!).

Dryopteris paleata Copeland, Philip. Journ. Sci., 9 C, 228. 1914. This comes very near to *D. Hallieri*, but is much more hairy and the indusia are rather persistent and hirsute. Costae above bearded as in *D. Hallieri*, beneath like the veins densely but shortly and softly villous, the margins long-ciliate. Further it differs in the rachis being densely scaly throughout, the scales about 1-2 cm. long, castaneous, lanceolate-acuminate, slightly fimbriated; and in all pinnæ being short-stalked, at least distinctly so in the specimen from the Peninsula, which otherwise agrees closely with a cotype specimen in Herb. Bonaparte. Pinnæ 15-20 cm. long, 2-2.5 cm. wide. Sporangia with numerous globose glands intermixed.

SUMATRA: Lebang Tandai, Benkoelen (C. J. Brooks 68. Herb. Bonaparte).

NEGRI SEMBILAN: G. Angsi (Holtum 9926).

Dryopteris trichopoda C. Chr., Ind. 298.

Nephrodium polytrichum Baker, Jour. Bot., 1891, 107.

Leaf 1 meter or more long, subcoriaceous. Pinnæ up to 30 cm. long, 4.5 cm. broad, long-acuminate, sessile, incised to a wing 5 mm. broad, the segments falcate, 5 mm. broad the upper basal one somewhat reduced; costae and veins

densely hirsute beneath with long patent hairs. costae above shortly strigose, not bearded as in *D. Hallieri*. Veins 14-15 jugate, not raised below, the basal ones connivent below the sinus. Sori inframedial; indusia small, hirsute.

SARAWAK: Lingga Mts., (Bishop Hose, Kew!; Hewitt).

The rachis is not destitute of paleae as described by Baker; the scales become fewer upwards and extend to the lower part of the costae beneath as in the other species of the group.

To *D. trichopoda* I refer with some doubt a couple of specimens, that differ from the type in thinner texture, more soft pubescence and narrower pinnae; the under side is slightly glandular with red glands, the receptacle with many globose glands.

PENANG: C. G. Matthew 934 (Herb. C. Chr.).

SUMATRA: J. Winkler.

This form is evidently *N. crinipes* of Ridley (p. 71), not of Hooker.

The North-Indian *D. crinipes* is quite another species, with the basal veins truly united and with several pairs of reduced pinnae below.

Dryopteris persquamifera v. A. v. R.. (Bull. Jard. Bot. Buitenzorg, Ser. II, no. XVI, 10. 1914) from Celebes, known to me from description only, is evidently a species of this group.

The following species resembles in several characters those just mentioned, but its pubescence is peculiar and the venation is different, so that I dare not now associate it with them.

***Dryopteris monodonta* C. Chr., Ind. 278.**

Lastrea unidentata Bedd., Handb. Suppl., 53; Ridley 64. (not *Dryopteris unidentata* (Hook. et Arn.) C. Chr.).

A specimen from the type locality, Gunong Bubu, Perak (Wray 3873) belongs no doubt to this species, although it does not agree in all details with Beddome's description. It is easily distinguished from the former species by stipe and rachis being densely and softly velutinous with thin jointed hairs, which are mixed with several lanceolate castaneous or blackish scales like those of *D. paleata*; in young leaves these scales are probably much more numerous. Pinnae strictly sessile, the basal segments somewhat produced and sublobate at base (rarely unidentate as described by Beddome, the name thus an unsuitable one) costae densely tomentose (not bearded) above, more thinly hirsute beneath with hairs like those of the rachis, and beneath dotted with conspicuous yellowish, dull glands. The basal veins spring both out from the midrib above its base and reach the margin above the bottom of the sinus as in the subgenus *Lastrea*. Sori

inframedial or subcostular, the indusia brown, thin, erose, glabrous, subpersistent.

Dryopteris heterocarpa (Bl.) O. Kze.

To this extremely variable species I refer as a glabrous form *Nephrodium glaucostipes* Bedd. (Ridley 75) judging from a cotype specimen in the Singapore Herbarium (Kunstler 2046). The under side is densely dotted with yellow glands as in the type, a character not mentioned in Beddome's description. Only one pair of veins truly join, and the following two run to the sinus. Similar forms occur in Borneo.

Dryopteris angustipes Copeland, Philipp. Journ. Sci., 7 C, 60, 1912.

NEGRI SEMBILAN: Setul Pass (E. S. & G. Hose 5050, received from Kew as *Nephrodium molle*).

A weakly characterised species, nearer *D. heterocarpa* than the *parasitica* complex, marked by a long row of reduced auriculiform pinnae along the stipe nearly to its base, the densely glandular under side, which is glabrous beyond the antrorsely strigose costae and contulae, the upper side strigose with appressed hairs and with scattered patent hairs on the veins; only one pair of veins anastomose. The specimen quoted agrees well with the type from Sarawak (Brooks 110, Herb. Copeland!). I am inclined to consider it a form of *D. heterocarpa*.

Dryopteris parasitica (L.) O. Kze. C. Chr., Ind., pro parte.

Nephrodium didymosorum Bedd., Ferns Brit. Ind., pl. 200.

Nephrodium tectum Bedd., Handb. Suppl., 79.

N. molle var. *didymosorum* Ridley 73.

Lastrea cana Bedd., Kew Bull., 1909, 424; Ridley 64. (not J. Sm.)

Among the numerous forms spread through all the tropics referred by authors to *D. parasitica* (*Nephrodium molle* auctt.) that described as *N. didymosorum* Bedd. best agrees with the genuine *Polypodium parasiticum* L., which is rather common in South-eastern China. It is densely hairy throughout, the lower pinnae not abbreviated and only one pair of anastomosing veins; sori often in a single pair at the base of each segment, but this character is not constant, 3-6 pairs of sori often being present. The specimen from Selangor (Ridley 7859) referred by Beddome and Ridley to *L. cana* belongs here; the genuine *D. cana* is a *Lastrea* with free veins.

Quite different from the true *D. parasitica* is a group of forms, which occur everywhere in tropical Asia and are commonly referred to *Nephrodium molle*, the type of which

is American, and to *N. amboinense*; I now refer them all to a single species, which I call

***Dryopteris subpubescens* (Bl.) C. Chr. comb. nov.**

Aspidium subpubescens Bl., Enum., 149. 1828.

Nephrodium amboinense auctt.; Bedd., Handb. Suppl., 75.

N. molle var. *amboinense* Ridley 73.

This species differs materially from *D. parasitica* by the lower 2-3 pairs of pinnae being considerably abbreviated, by the less pubescent, often subglabrous surfaces, and by 3 or 4 lower veins (2 pairs) being united. The typical form is smaller than *D. parasitica*, the pinnae rarely 10 cm. long, 1.5 cm. broad. Hitherto this species has been named by most authors *N. amboinense* or *N. molle* var. *amboinense*, but it agrees badly with the type specimen of *Aspidium amboinense* Willd. (Bot. Mus. Berlin!) which is much smaller and less incised. Till now I have seen no specimen that exactly matches Willdenow's type from Amboyna, while on the other hand numerous specimens examined closely agree with the type of *A. subpubescens* Bl. from Java, leg. Blume! Typical *subpubescens* is a common fern in Malaya and several specimens from the Peninsula have been seen.

To this species I provisionally refer as a variety: var. **major** (Bedd.).

Nephrodium molle var. *major* Bedd., Handb. Suppl., 76.

Dryopteris sumatrana v. A. v. R., Mal. Ferns, 227.

Larger than the type; pinnae up to 15 cm. long, 2 cm. broad, bright green and of firmer texture, both surfaces finely downy with longer hairs on the costae and veins.

Common in Borneo, Sumatra and in the Peninsula (Singapore, Ridley 9481 and other specimens seen). It is perhaps a distinct species, but specimens from Borneo are intermediate between it and typical *D. subpubescens*.

To this variety I refer a specimen from Singapore (Rifle Range) quoted by Ridley under his *N. multilineatum* (p. 72). It differs from the common form by the lack of abbreviated pinnae, but as to all other characters it is typical. *N. multilineatum* Bedd. and Ridley should be called *Dryopteris megaphylla* (Mett.) C. Chr. It is widely different from all forms of the *parasitica* complex by its much larger fronds with pinnae up to 30 cm. long, nearly glabrous, shallowly cut only and with several pairs of alternately anastomosing veins. Several specimens distributed from Kew under the name *N. brachyodon* belong here.

A third, but somewhat doubtful species, is ***Dryopteris procurrens* (Mett.) O. Kze.; C. Chr., Ind.**

Nephrodium molle var. *procurrens* Ridley 73.

It differs mainly from *D. subpubescens* by its long creeping rhizome, but is otherwise so like it that specimens

without rhizome can scarcely be determined with certainty. Studies in the field may decide, perhaps, whether it is a good species, or, as Beddome believed, a form of *D. subpubescens*. The north Indian form referred by some authors to *D. procurrens* seems to be another thing. It is the var. *aureum* Clarke (Bedd. Handb. 278) and has been later redescribed as *Dryopteris cylindrothrix* Rosenstock, Fedde Repert., 12, 246. 1913.

Dryopteris Toppingii Copeland, Philipp. Journ. Sci., 12 C, 56. 1917. A co-type specimen of *Nephrodium pennigerum* var. *malayense* Bedd. (Handb. Suppl. 74: *Dryopteris indica* var. *malayense* v. A. v. R., Mal. Ferns 224: *Nephrodium indicum* Ridley 73) agrees very closely with the type of *D. Toppingii* from Mt. Kinabalu, B.N.Borneo (Topping 1766, Herb. Copeland!), differing by both surfaces being slightly downy and the indusia being pubescent; notwithstanding this difference I prefer to call the specimen *D. Toppingii*. The sori are not medial on the veins as described by Ridley but submarginal just as in the type.

Dryopteris mirabilis Copeland, Philipp. Journ. Sci., 6 C, 137, pl. 19. 1911.

Phegopteris cordifolia v. A. v. R. Bull. Jard. Buitenzorg, II S, XI, 19, pl. 5. 1913.

Dryopteris cordifolia v. A. v. R., l. c., C. Chr., Ind. Suppl. préll., 14.

Polypodium holophyllum Baker, Journ. Bot., 1888, 325 (not 1879, 43).

Dryopteris holophylla C. Chr., Ind., 271. 1905.

KEDAH: Pulau Langkawi (Holttum 17436).

As here interpreted this species includes a number of forms, which most authors have referred to *D. glandulosa* (Bl.) O. Kze. They differ from that species by the lateral pinnae being very few (1-2 pairs) or none, and much smaller than the large terminal one, and by the lack of glands; both surfaces densely verrucose. The frond is sometimes simple, cordate at base, and the edges subentire; this is *D. holophylla* from Sarawak (Hose, Kew!). *D. cordifolia* v. A. v. R. from Dutch Borneo (cotype in Rijks Herb. Leiden!) is the same with 2-3 lateral pinnae, and *D. mirabilis* Copeland from Sarawak (Brooks, Herb. Copeland!) is very nearly the same with a single pair of pinnae and with the indusiate sori arranged in distinct rows parallel to the midrib; the end pinna is more or less deeply crenate-dentate. The specimen from Kedah agrees best with *D. mirabilis* Copel., type, but 3-5 lateral pinnae are present. Like most forms of the species its leaves are subdimorphous, the fertile ones being narrower on longer stalks.

Dryopteris vilis (Kze.) O. Kze.; C. Chr., Index, 300.

Aspidium intermedium Bl., Enum., 161; not others.

Dryopteris intermedia O. Kze.; v. A. v. R., Bull.

Jard. Buitenzorg, III S, 2, 144. 1920.

?*Lastrea intermedia* Ridley 68.

Dryopteris rhodolepis C. Chr., Ind. 288, pro parte.

Nephrodium sarawakense Bak., Journ. Linn. Soc. Bot., 22, 225. 1886.

Dryopteris sarawakensis v. A. v. R., Mal. Ferns, 200.

Lastrea padangensis Bedd., Handb. Suppl., 60. 1892. Ridley 68.

Dryopteris padangensis C. Chr., Ind. 282.

According to Prof. Rosenstock, who has examined the type specimens of both species in Leiden, *Aspidium vile* Kze is identical with *A. intermedium* Bl., and *N. sarawakense* Bak. (type, Kew!) is exactly the same. Unaware of this, in my Index I preferred for the whole complex of forms referred in Hook. Bak. Syn. Fil. to *N. intermedium* Clarke's name *rhodolepis*, used originally for a north Indian form, which I now consider distinct from *A. intermedium* Bl. Both this name and *Lastrea Blumei* Moore are invalidated within the genus, and the species must, therefore, now be called *D. vilis*. It seems to be very variable, and found in most regions of tropical Asia and Polynesia, in some places running gradually into related species, e.g. *D. aciculata* (Bak.) C. Chr. I hope to be enabled to unravel these forms later on; here it must suffice to state that all specimens seen from the Malay Peninsula belong with approximate certainty to *D. vilis*; very likely the large *D. aciculata* also occurs there, as it is common in Bornco. I have received from Mr. Holtum a specimen from Pahang, gorge of the Tras (Burkill 16939) named *D. padangensis* (Bedd.) C. Chr. It agrees excellently with Beddome's description, and I think it was rightly named; it appears to be fully identical with *D. vilis* (*N. sarawakensis* Bak.), and I dare, therefore, reduce Beddome's species to a synonym. Another specimen from Pahang, (Buloh Telang, P. Tioman, Henderson 18593) is unfortunately sterile; it is intermediate between *D. vilis* and *D. aciculata* and belongs perhaps to the latter species.

Dryopteris Boryana (Willd.) O. Kze.; C. Chr., Ind.

Phegopteris Kingi Bedd., Handb. Suppl., 84; Ridley 54.

Dryopteris Kingi C. Chr., Ind. 273.

Although Beddome (Handb. 266) quoted "Malay Peninsula" as a locality for his *Lastrea Boryana*, the species is not mentioned by Ridley. Having seen a couple of pinnae of the type collection of *Phegopteris Kingi* Bedd. from Perak (Kunstler 2250) I have little doubt that the "species" is a form of *D. Boryana*. It differs a little from the form occurring in Java by the pale green colour and apparently

exindusiate sori; in size, texture cutting and pubescence it is identical. *Polypodium subtripinnatum* Clarke, referred here by Beddome, is another exindusiate form. Whether the Indian-Malayan *D. Boryana* is the same as the genuine *D. Boryana* (Willd.) from Réunion is another question; if not, the old name *Aspidium divisum* Wall. (*Nephrodium* Hook.) must be taken up for the Asiatic forms.

Polystichum lindsaeifolium Scort., Ridley 61 (wrongly spelled *lindseaeifolium*).

The specimen from Kelantan (Nur 12118) referred here by Ridley is so different from the North-Indian *P. obliquum* (Don) Moore that I consider Ridley's new species a good one. The leaves are much longer, up to 30 cm. long by 3.5 cm. wide, with 30-35 pairs of pinnae; these are subdimidiate, auricled at the upper base and shallowly crenately toothed at the upper and outer edge, the short teeth obtuse, never aristate, the stipe 4-5 cm. long with only some light brown scales, the rachis very scantily fibrillose or almost naked as are the surfaces; at best some few minute scales may be found beneath. Sori submarginal at the base of the teeth; indusia pale, orbicular, easily rubbed off.

Aspidium subdecurrans (Lueress.) C. Chr., Ind. 94.

Phegopteris subdecurrans Lueress., Bot. Centralbl., 11, 30. 1882.

SINGAPORE: Pulau Ubin (F. Kehding 2960!, Ridley 6027).

This characteristic species was omitted by Ridley although collected by himself at the type-locality. It is allied to *A. polymorphum* Wall., distinguished from that species by the terminal pinna being decurrent. The quite glabrous fronds are somewhat dimorphous, the sterile ones being larger than the fertile; terminal pinna of sterile frond up to 35 cm. long and 15 cm. wide, ovate, acuminate, entire or repand, at base confluent with one or two pairs of ascending large lobes, the lowest of which are decurrent along the rachis, the wing thus formed not reaching the upper pair of free pinnae, which are adnate to the rachis;¹ below them another pair of free, short-stalked entire pinnae, these broadest at the middle (6 cm.) and narrowed to both ends; fertile fronds similar but smaller; main veins distinct to the edge, connected by numerous arching cross-veins, smaller veins forming numerous angular areoles, mostly without free included veinlets. Sori exindusiate, small, irregularly scattered, dorsal on the netted veins, often elongated and confluent.

Aspidium terminale Rosenstock, Meded. 's Rijks Herb. Leiden, 31, 4. 1917.

¹ The extent of the wing on the rachis is very variable in this species. It is sometimes continuous throughout the rachis, extending even below the lowest pinnae. (R.E.H.)

LOWER SIAM: Khaw Pok Hill (Haniff & Nur 3828).

This most distinct species was founded by Prof. Rosenstock on a specimen from Dutch Borneo (Gunong Kempai, Hallier 1821, Rijks Herb. Leiden!) and very briefly described. In all essential characters the specimen from Siam kindly sent me by Mr. Holttum fully agrees, but receding from it in some minor points. The type may shortly be described thus:

In habit not essentially different from *A. polymorphum* Wall. The leaf is pinnate with three pairs of opposite short-stalked pinnae, which are all entire, cordate at base, oblong, acute or short-acuminate, the lowest 25 cm. long by 7 cm. wide and with a triangular hastate terminal pinna, cordate at base and with a pair of spreading basal lobes, the central lobe triangular, slightly lobed. Texture thin, the larger ribs very shortly rusty-tomentose above, the surfaces otherwise glabrous. A scaly bud is borne on the upper side of the rachis at the base of the terminal pinna, and smaller buds are found on the costa, mostly at the axil of a main vein, sometimes also on the basal cross-veins. All veins distinct, the finer ones forming a dense net of small areoles between the cross-veins, the areoles with free included veinlets. Sori irregularly scattered over the whole underside, very small, nearly always apical on the free veinlets. Indusia subpersistent, reniform, glabrous. The specimen from Siam agrees with the type in colour, texture, venation and sori; there is no bud on the rachis, but small buds are found here and there in the axils of the main veins. It differs chiefly in the shape of the pinnae, which are ovate or elliptical, rounded-cuneate at base, the basal ones unequally short-lobed, 18 cm. long by 10 cm. wide at the middle.

A. terminale differs chiefly from *A. polymorphum* by the gemmiferous rachis and costa and by the apical sori.

***Leptochilus malaccensis* sp. nov.**

Rhizome creeping, clothed with dark brown lanceolate entire scales. Leaves subapproximate, dimorphic. Stipe of sterile ones about 20 cm. long, slightly scaly. Lamina about 25 cm. long and wide, with 5-7 pairs of distant lateral pinnae and a conform terminal one, dark green, subcoriaceous, glabrous but obscurely paleaceous on the costa beneath and on rachis, the scales small, blackish-brown. Pinnae lanceolate, up to 15 cm. long, 1-1.2 cm. wide at the middle, the lower ones short-stalked, the upper adnate to rachis and a little decurrent, all long-cuneate at base and long-acuminate at apex, entire. Main veins tolerably visible to near the edges, other veins quite hidden. The veins anastomose about as in *L. heteroclitus* (Bl.), i.e. forming a costal areole and above this two large costular ones on each side of the main vein; between these are found three central ones, a middle larger

one and an upper and lower smaller one, all areoles without free included veinlets. Fertile frond similar with contracted pinnae, which are about 10 cm. long, 7-8 mm. wide.

PAHANG: Buloh Telang, Pulau Tioman, (M. R. Henderson, Herb. Singapore, 18589, type in Herb. C. Chr.). KEDAH: P. Langkawi. G. Raya, (Curtis 3371, L. Preslianus Ridley 115).

This apparently most distinct species was wrongly referred to *L. Preslianus* C. Chr. by Ridley, l. c. Certainly it resembles that species superficially, but the venation is totally different, resembling that of *L. heterochitus* (Bl.) C. Chr. (cf. Blume, Fl. Javae, pl. 13) but owing to the narrowness of the pinnae, the number of intercostular areoles is, of course, much smaller.

Stenochlaena leptocarpa (Fée) Underwood, Bull. Torrey Bot. Club, 33, 47. 1906.

Lomariopsis leptocarpa Fée, Acrost., 69, pl. 29. 1845.

Stenochlaena sorbifolia, pro parte, Ridley 111.

PERAK: Birch's Hill, (I. H. Burkill, Herb. Singapore 12725).

The specimen agrees closely with Fée's figure of the type from Luzon (Cuming 132). Among the Malayan species of the genus this resembles most the West Indian *S. sorbifolia*, but is yet quite different. The numerous sterile pinnae are about 12 cm. long and scarcely 1.5 cm. wide, gradually long-acuminate, their base subequally rounded-cuneate. The species is probably widely dispersed through the Malayan region.

Stenochlaena cochinchinensis (Fée) Underwood, Bull. Torrey Bot. Club, 33, 46. 1906.

Lomariopsis cochinchinensis Fée, Acrost., 66, pl. 26. 1845.

Stenochlaena abrupta v. A. v. R., Bull. Jard. Buitenzorg, II S, XX, 24. 1915. Handb. Suppl., 429.

Stenochlaena sorbifolia, pro parte, Ridley 111.

SINGAPORE: Botanic Garden, in the Dell (Herb. Singapore, 17484).

PAHANG: Sedagong, Pulau Tioman (Henderson 18618).

One of the best characterized species of the *S. sorbifolia* complex. Sterile leaves sometimes simple, but developed ones pinnate with up to 12 pairs of pinnae, these 12-15 cm. long by 4-5 cm wide, the base cuneate below, rounded above, the apex suddenly narrowed into a short "traufelspitze." *S. abrupta* v. A. v. R. is the same (an authentic specimen in herb. Leiden). The species is known from Cochinchina, Borneo, the Malay Peninsula, and Sumatra.

LINDSAYA

The smaller, simply pinnate forms of this genus were referred by older authors to several distinct species, the number of which later was greatly reduced, and Baker and Beddome referred most of them to a single species, *L. cultrata*. It seems to me however that some of the older species may be maintained as valid ones, and I shall here try to characterize briefly those species recorded from the Malay Peninsula.

A. Rhizome short-creeping, often very short, the leaves tufted, or nearly so.

1. *L. cultrata* (Willd.) Sw. . .

Stipe and rachis round beneath, sulcate above; pinnae about 1. cm. long, subacute, the lower edge convex, the upper nearly straight, with 2-3 low incisures; sori rather long.

This species was first described and figured by Willdenow as *Adiantum cultratum* (Phytogr., 14, pl. 10, fig. 2) after specimens from the Malabar coast, probably from the vicinity of Tranquebar. All south Indian specimens seem to agree very well with his type, and specimens from Himalaya, southern China and Siam are not essentially different. The species is said to be distributed through the whole of tropical Asia, but I have seen no specimens from the Malayan region that agree with the type, although it is possible that the species is to be found there. Most specimens from the Peninsula received as *L. cultrata* belong to the following species. Ridley (p. 22) quotes a large number of localities for *L. cultrata*; I suppose that the majority of them, perhaps all, really belong to

2. *L. Lobbianae* Hook., Spec., 1, 205, pl. 62 C.

L. crenulata Fée, Gen., 105, pl. 28, fig. 2.

Stipe and rachis quadrangular, sulcate above, the furrow with sharp raised edges. Leaf often much longer than that of *L. cultrata*, pinnae about 1 cm. long, the lower side straight or concave, the apex truncate, the upper side with 2-4 rather deep incisures; sori mostly shorter than in *L. cultrata* and extending to the outer edge. This species is apparently common through the Malayan region. Its synonymy is confused, and it is possible that the name chosen cannot stand; the older name *L. lucida* Bl., Enum. 216 (1828) applies perhaps to the same species. Judging from the figures quoted it seems probable that *L. crenulata* Fée, described from a specimen leg. Griffith presumably in Malacca, is identical with *L. Lobbianae*. Both were referred by Kuhn (Ann. Mus. Lugd. Bat. 4, 276) to *L. gracilis* Bl. as a var. *major*, but wrongly, I think, at least if *L. gracilis* Bl. is rightly understood by modern writers as being a species with a wide-creeping rhizome.

L. Lobbiana is apparently common in the Malay Peninsula; the following specimens were all named *L. cultrata*.

PAHANG: Buloh Telang, P. Tioman (Henderson 18587). TRENGGANU: Kuala Berang (Holtum 15332). JOHORE: (A. Vesterdal 26 and 168).

3. *L. concinna* J. Sm.; Hook., Spec., 1, 205, pl. 61 B.

Stipe and rachis quadrangular; pinnae 5-8 mm. long, the lower side mostly straight or convex, the apex bluntly rounded or subacute, the upper edge entire, the sori, therefore, continuous from base to tip, rarely interrupted by a single incisure. Sterile pinnae obtusely toothed or crenate.

This species has been confounded with *L. gracilis*, from which it differs by its short rhizome and tufted leaves. It is known from the Philippine Islands, New Guinea, Borneo and occurs no doubt in the Malay Peninsula. Ridley refers two specimens to it (p. 21); his description is adequate.

4. *L. orbiculata* (Lam.) Mett. (*L. flabellulata* Ridley 23).

I mention this polymorphic species here, because the simply-pinnate forms of it often are confounded with the species mentioned above. These smaller forms differ manifestly from the other species by the shape of the pinnae, which are either semicircular or triangular with the sori along the outer edge, the sterile ones acutely dentate, the indusia distinctly toothed. A small specimen from PAHANG: Sungei Perting (Burkill 16574), received under the name *L. cultrata*, belongs here.

B. Rhizome wide-creeping with distant leaves.

5. *L. gracilis* Bl.; v. A. v. R., Handb. 261.

With this species as interpreted by van Rosenburgh I am not acquainted; the specimens so named seen by me I refer to *L. adiantoides* (Bl.) Kuhn. Mettenius and Kuhn united it with *L. concinna* and I am not sure that these authors were wrong, because Mettenius had examined Blume's type. Ridley (p. 22), who takes the species in the sense of v. A. v. R., refers to it a specimen from Negri Sembilan. The long creeping rhizome seems to be the only reliable character.

6. *L. plumula* Ridley, p. 22.

This species is distinct enough from the four species mentioned under group A by its long creeping branched rhizome, and certainly it is not *L. gracilis* v. A. v. R. It agrees with *L. cultrata* by its semiterete stipes and rachis and in shape of pinnae. These are 5-7 mm. long, ascending, the lower edge convex, the upper slightly incised, coriaceous in texture, pale green, the lower and inner edge narrowly involute resembling a strong rib and believed by Ridley to be a rib; the real vein along the lower edge is however not

thicker than in other species. The indusia are broader than in the other species, their uneven edge reaching quite to the margin. The species is no doubt closely related to *L. cultrata*.

***Nephrolepis acutifolia* (Desv.) Christ.**

Negri Sembilan: Seremban (E. S. & G. Hose 5016, received from Kew). This interesting species is in habit and pubescence a *Nephrolepis*, in sori a *Lindsaya*. To me it is the type-species of a most distinct genus *Isoloma* J. Sm., which name very unnaturally has been applied to a group of species which may scarcely be separated generically from *Lindsaya*.

***Humata angustata* (Wall.) J. Sm. var. *hastata*, n. var.**

Fertile leaves 3-8 cm. long, 1 cm. wide, lamina suddenly narrowed and decurrent nearly to the base of the stipe, this 1-1.5 cm. long and with the decurrent wings 1-1.5 mm. broad above; margins broadly lobed about half-way, the lobes irregularly crenate, the basal ones often the largest, 5-8 mm. long, horizontal, the lamina becoming hastate.

PAHANG: G. Kajang, Pulau Tioman (Henderson 18256).

Not knowing similar forms occurring in Borneo, one would be inclined to consider this remarkable plant specifically distinct from *H. angustata*, with which it agrees in scales, texture, colour and sori. It differs chiefly from specimens from Borneo by its small size, short stipe and hastate shape of most leaves. *H. attenuata* and *H. mutata* v. A. v. R., Bull. Jard. Bot. Buitenzorg, III S, 5, 205-206 (1922), are evidently closely related forms and also local derivatives of *H. angustata*.

***Humata kinabaluensis* Copeland, Philipp. Journ. Sci., 12 C, 48. 1917.**

To this species I refer with a little doubt a specimen from Pahang (G. Berumban, Cameron's Highlands, Henderson 17989) named by Mr. Holttum *H. alpina* (Bl.) Moore. It is certainly not that species but agrees very well with Copeland's species from Mt. Kinabalu (Topping 1745, Herb. Copeland!). I have seen two fertile leaves only; they are thickly coriaceous, tripinnatifid at base, the pinnae almost reduced to the thick ribs, each secondary segment bearing 3-4 sori with large indusia. This form resembles much more the genuine *H. botrychioides* Brack. from Polynesia than other Malayan forms wrongly referred to that species.

***Microlepis Ridleyi* Copeland, Philipp. Journ. Sci., 11 C, 39. 1916.**

This species is not mentioned by Ridley, although founded upon a specimen from Pahang collected by himself (no. 14200). I have received from Mr. Holttum a specimen

from the same state (Bentong, Burkill 16699) which corresponds closely to Copeland's description. The surfaces are not glabrous as described by him, but, especially the under side, microscopically puberulous, the hairs not dense. In this it approaches a specimen from Perak (Kunstler 8331) referred by Ridley (p. 32) to *M. Kurzii* (Clarke) Bedd. It does not belong to that species, of which I have what I consider a typical specimen from Burma, and which is, in a few words, a densely hairy *M. platyphylla*. Kunstler's specimen has the pinnules pinnatifid almost to the costules and the whole underside is very densely puberulous with short erect hairs mixed with some longer ones on the ribs. Mr. Holttum is of opinion that it is a form of *M. Ridleyi*, and perhaps he is right, but certainly it is the same as *M. Brooksii* Copeland from Sumatra, and probably also identical with *M. puberula* v. A. v. R. All seem to be forms of a single species.

***Microlepia speluncae* (L.) Moore., var. villosissima n. var.**

The whole frond, especially beneath, very densely villous with grey shorter and longer hairs mixed together, the longer hairs prevailing on the upper side. Probably a distinct species.

PAHANG: Pulau Tioman (Henderson 18873, Herb. C. Chr.).

***Saccoloma minus* (Hook) C. Chr. comb. nov.**

Microlepia alata J. Sm., Hook. Journ. Bot., 3, 416. 1841. (nomen).

Davallia inaequalis var. *minor* Hook., Spec. Fil., 1, 180, pl. 58 A. 1846. .

Saccoloma moluccanum Mett.; C. Chr., Ind.

Dennstaedtia Kingii Bedd., Handb. Suppl., 6. Ridley 10.

PERAK: Larut (Kunstler 2118, cotype of *D. Kingii* Bedd.); Maxwell's Hill (Haniff 9083).

By his researches in Blume's herbarium in Leiden, Prof. Rosenstock has proved that Mettenius was mistaken in identifying *Microlepia alata* J. Sm., based on Cuming no. 119, and first described and figured by Hooker, with *Davallia moluccana* Bl.; the great bulk of specimens by Blume so named are identical with *Davallia amboynensis* Hook. = *Tapeinidium amboynensis* (Hook.) C. Chr. Ind. 631, which species subsequently must be named ***Tapeinidium moluccanum*** (Bl.) C. Chr. comb. nov. A single specimen in Blume's herbarium, and the only one seen by Mettenius, was with doubt referred by Blume himself to *D. moluccana*; it is thus the type of *Saccoloma moluccanum* Mett. I have a fragment of it, kindly sent by Prof. Rosenstock, and it agrees so closely with the two specimens from Perak that it may scarcely be

doubted that *Dennstaedtia Kingii* Bedd. is the same thing. Apparently it differs in indusial characters from *Saccoloma*, the indusium being cup-shaped, scarcely at all two-lipped, often protruding beyond the margin, and reflexed as in several species of *Dennstaedtia*, but the inner valve is distinctly attenuate towards the base, as in *Saccoloma*, and the whole habit with the characteristic unequal sided pinnæ and pinnulae, is entirely that of that genus.

In Blume's specimen the indusia are slightly two-lipped, but materially not different. From this Malayan type several of the Polynesian forms commonly referred to the same species are considerably different.

***Asplenium scolopendroides* J. Sm.**

PAHANG: Pulau Tioman, (Henderson 18763).

Easily distinguished from other simple-fronded species by the characteristic vein-like rim running parallel to the sori between two real veins. The specimen from P. Tioman agrees closely with the type at Kew (Cuming 318), well illustrated by Hooker (Ic. Plant., pl. 930), though the venation is not accurately shown.

***Asplenium dimidiatum* Sw.**

To this species Ridley (p. 46) refers a couple of specimens, of which I have seen that from Singapore. It is not at all *A. dimidiatum*, which is certainly not found in Asia, but it is difficult to say what the scanty specimen may be. It may be, as suggested by Beddome, a form of *A. adiantoides* (L.) C. Chr. (= *A. falcatum* Lam.), or perhaps of *A. nigrescens* Bl.

***Asplenium normale* Don.**

Some of the specimens referred by Ridley to *A. lunulatum*, at least Kunstler 8043, belong here. The genuine *A. lunulatum* Sw. certainly does not occur in the Malayan region; whether any of the many species related to it occurs in the Peninsula I do not know.

***Asplenium perakense* Matthew et Christ; Ridley 47.**

The specimen from Pahang quoted by Ridley (Holtum 11385) agrees excellently with Christ's description and is no doubt rightly named. It falls under *A. praemorsum* Sw. taken in a wide sense, but seems to be a distinct form worthy of specific rank. In gross characters it scarcely differs from other forms of *A. praemorsum*, but its scales seem to mark it sufficiently. They are of a pure brown, peltate, triangular-long-acuminate but not hair-pointed, slightly toothed at base, entire upwards, very finely reticulated but not clathrate; they differ widely from those of the Indian form of *A. praemorsum*, which are blackish, clathrate, shortly ciliate and hair-pointed.

***Asplenium spathulinum* J. Sm., Hook. Journ. Bot., 3, 408. 1841.**

A. cuneatum Ridley 48.

A. affine auctt., quoad plant. asiat.

PERAK: Bujong Malacca (Ridley 9546). PAHANG: Sedagong, P. Tioman (Henderson 18898).

The two specimens quoted match perfectly the type (Cuming 210. Kew!) and their resemblance to the true *A. cuneatum* Sw. of the West Indies is superficial only. The species is much closer allied to *A. affine* Sw. from the Mascarene Islands, but I think it is specifically different, being marked by the obtuse, erosodentate outer edge of the cuneate pinnules and by not being proliferous.

A. cuneatum var. *affine* Ridley (p. 48) from Perak (Kunstler 2228) is to me a tripinnate form of *A. spathulinum*. All these *Asplenium* differ very much in the degree of cutting.

***Diplazium xiphophyllum* (Bak.) C. Chr.**

This species, founded upon a poor specimen from Borneo (Burbidge, Kew!) is apparently not rare in the Peninsula, but probably often confounded with *D. bantamense*, from which it differs chiefly by its narrower and much longer pinnae, often 40-45 cm. long, 3-3.5 cm. wide, terminating in a very long subulate apex.

Perak: G. Hijau (Burkill 12663). Pahang: Ulu Chineras (Burkill 15692). The former specimen differs from the type by the pinnae being irregularly double-crenate throughout; the latter by the lower pinnae being subcuneate at base; it matches nearly exactly *D. palauanense* Copeland, which I refer to *D. xiphophyllum*.

***Diplazium sorzogonense* Pr. and related forms.**

This group of bipinnatifid species is extremely difficult, and the various forms are hopelessly mixed together in all herbaria. The material at hand from the Malay Peninsula may naturally be sorted into two species, *D. sorzogonense* and *D. speciosum* of Ridley (p. 51-52). They may briefly be characterized as follows:

***Diplazium malaccense* Presl, Epim. 86. 1849. Fée, Gen. 213, pl. 17 D, fig. 1.**

D. Schkurii J. Sm., Hook. Journ. Bot., 3, 407 (nomen).

Asplenium Schkurii Mett., Aspl. no. 208.

Diplazium acuminatum Bl., Enum., 193. 1828?. v. A. v. R., Mal. Ferns, 409 (p. p.). (not Raddi).

D. Christii C. Chr., Ind. 229. 1905 (p. p.)

D. speciosum Ridley, 52 (entirely or partly).

Rachis and costae beneath naked or very slightly scaly; pinnae 2 cm. wide, cut $1\frac{1}{2}$ — $\frac{2}{3}$ of the way to the costa, oblique, oblong, 5 mm. broad, truncate, entire or slightly dentate at the apex; veins simple, 6-7-jugate; the anterior basal sorus diplazioid.

PAHANG: Fraser Hill (Nur 10508). NEGRI SEMBILAN: Bukit Putus (E. S. & G. Hose 174, received from Kew).

Diplazium sorzogonense Presl.

Stipe, rachis and costae beneath more or less densely fibrillose with narrow brown or castaneous scales; pinnae 2-5 cm. broad, cut down to a wing 3-4 mm. broad into sub-horizontal oblong obtuse segments 4-5 mm. broad and finely serrate throughout or at the outer part only; veins simple, 10-11-jugate; diplazioid sori rarely found.

MALAY PENINSULA: (W. Norris 637, Herb. Copenhagen). PAHANG: G. Tahan (Nur. 7953); G. Rokam, P. Tioman (Henderson 18612).

D. speciosum Bl. is referred by most authors to *D. sorzogonense*, but considered distinct by v. A. v. R.; if rightly I dare not now express an opinion.

Diplazium crenato-serratum Bl.

D. larutense Bedd. (Ridley 50) is probably a form of this species. I have not seen the type, but a specimen from Negri Sembilan (Holtum 9775) is said by Mr. Holtum to resemble the type of *D. larutense*, and it is to me very typical *D. crenato-serratum*. In a collection from Sumatra are found among typical leaves some that correspond closely to Beddome's description, especially by the broadly rounded tips of the pinnae.

Polypodium subevenosum Baker.

P. Maxwellii Baker, Kew Bull., 1893, 211.

? *P. kinabaluense* Copeland, Philipp. Journ. Sci., 12 c, 60, 1917.

Mr. Holtum has sent me specimens from Penang, which he has compared with the type specimen at Kew and declares to be typical. As in the type some veins are produced and forked. The same specimens further fully agree with the type of *P. Maxwellii* Bak. from Borneo (Hose 296, Kew!) and with several other Bornean specimens recently examined; and *P. kinabaluense* Copel. from Mt. Kinabalu (Mrs. Clemens 10649, Herb. Copeland!) seems to me the same. The differential character of short, simple, or produced forked veins is not a stable one. More different from the type is a specimen from Pahang (G. Kajang, P. Tioman, Henderson 18944; herb. Singapore). It is larger; leaves 10-12 cm. long by 0.5 cm. wide, all veins forked and the sori distinctly oblong, almost linear and somewhat immersed. This form evidently approaches the genuine *P. sessilifolium* Hook.=*P. malaicum* v. A. v. R. (Handb. 577) a Philippine plant that may be different from *P. subevenosum* (t. Holtum). *P. subevenosum* var. *sessilifolium* Ridley (p. 81) is certainly *P. subevenosum*.

Polypodium minutum Bl., Enum. 130; Fl. Javae 188, pl. 87 D.

P. callophyllum C. H. Wright, Kew Bull., 1909, 362. Ridley 83.

PERAK: Gunong Hijau (C. G. Matthew, herb. Kew!).

I do not hesitate to refer this specimen to *P. minutum* Bl.; it agrees very perfectly with Blume's figure. In habit it resembles not a little *P. consociatum* from the same locality, differing from it by the oblong fertile segments, which are repand-crenate at the upper edge, and by the presence of two sori in several segments, one near its base, another in the outer half; sporangia mixed with many long hairs. Leaf grass-green, thin.

Polypodium consociatum v. A. v. R., Bull. Jard. Buitenzorg, II S, VII, p. 41, pl. 4, fig. 1. 1912. Handb. Suppl., 352.

Plectopteris gracilis Fée, Gen. 230, pl. 19B.

Calymmodon hirtus Brack., U. S. Expl. Exp., 16, 2.

Polypodium cucullatum Ridley 82 (pro parte?). (an Bedd. Handb. 307).

PERAK: Gunong Hijau, 3000 ft. (C. G. Matthew 925).

I have seen the only specimen quoted, but likely most or all of those quoted by Ridley under *P. cucullatum* belong to the same species that is abundantly different from *P. cucullatum*. The said specimen is perfectly identical with a beautiful lot of specimens from Mt. Dulit, Borneo (Mjöberg), which Prof. Copeland has named for me, giving the synonyms cited above. His identification may be right, but figures of Fée and v. A. v. R. do not show the characteristic shape of the upper fertile segments of my specimens; they are normally flat, rarely folded, and almost circular with a central sorus.

Polypodium Leysii Baker, Journ. Bot. 1879, 66.

Prosaptia semicrypta Copeland, Philipp. Journ. Sci., 9 C, 231. 1914.

Polypodium semicryptum C. Chr., Ind., Suppl. prél. 1912-16, 28.

PAHANG: Teku, G. Tahan (Haniff & Nur 8066); G. Rokan, P. Tioman (Henderson 18777).

The specimens were received from Mr. Holtum under the names *P. obliquatum* (8066) and *P. contiguum* var. (18777); they are nevertheless identical and agree perfectly with the type specimens of *P. Leysii* Baker from Sulu Archipelago, leg. Burbidge (Kew!) and of *Prosaptia semicrypta* Copel. from Benkoelen, Sumatra, leg. C. J. Brooks. (no. 93, Herb. Copeland!). The species is intermediate between *P. obliquatum* Bl. and *P. contiguum* (Forst.) differing from the former by the narrower, repand-crenate segments with submarginal sori; these sunk in deep cavities with raised, naked edges ("craters"), the craters oblique with the mouths nearly round. The genuine *P. obliquatum*

has broader, entire segments with the sori not close to the edge, the craters oblong; the genuine Polynesian *P. contiguum* (Forst.) (*Davallia* Ind. Fil.) has marginal sori with the craters protruding beyond the edge. Both species occur in the Malay Peninsula, but it seems probable that some specimens at least referred to them belong either to *P. Leysii* or to *P. Burbidgei* Bak., with which species *P. decipiens* Kuhn=*P. cryptosorum* C. Chr. (Ridley 84) must be united.

All these species are members of a narrow group of closely related species, some of which form the genus *Prosaptia*, very improperly referred by several authors, and in my Index, to *Davallia* as a subgenus, others belonging to *Eupolypodium*, forming a specialized group, *Cryptosorus*. All modern pteridologists agree, I think, in uniting *Cryptosorus* with *Prosaptia*, and either restore *Prosaptia* as a genus, or make it a subgenus of *Polypodium*. The alliance with *Davallia* is the furthest possible. To *Prosaptia* also belongs *P. barathrophyllum* Bak., found in Perak by Bishop Hose (Kew!); it is doubtfully different from *P. khasyanum* Hook.

***Polypodium mollicomum* Nees et Bl.**

P. fuscatum Ridley, l. c. 84 (and also Blume?).

P. malaccanum Bak., Ann. Bot. 5, 129. Ridley. l. c. 84 (excl. var.)

A co-type specimen of *P. malaccanum* Bak. from Gunong Mering (Ridley 3345, Herb. Singapore) is to me typical *P. mollicomum*. It differs from the following species by the more or less coriaceous leaves with indistinct veins, and with both surfaces throughout setose with rather short dark brown hairs.

***Polypodium brevivenosum* v. A. v. R., Bull. Jard. Bot. Buitenzorg, II S, XXVIII, 40. 1918. (ex descr.)**

P. malaccanum var. *pahangense* Ridley, l. c. 84.

PAHANG: (Herb. Singapore 8147, 15974, 17744).

Mr. Holttum has identified these specimens with *P. brevivenosum* from Sumatra, and I believe rightly. The species very much resembles in size and cutting *P. mollicomum*, but the leaves are thinner, the short lateral simple veins clearly visible, of a lighter colour, and the pubescence different; margins ciliated with long reddish hairs and few similar ones are scattered over the surfaces. Also the scales of the rhizome are much more numerous and conspicuous, light-castaneous, lanceolate, entire. I have the same species from Sarawak.

***Polypodium sarawakense* Baker, Journ. Linn. Soc., 22, 228. 1886.**

Pleopeltis superficialis var. *latifrons* Bedd., Journ. Bot., 31, 226.

Pl. peltata Scort.; v. A. v. R., Handb. Suppl. 376
Ridley l. c. 91.

Polypodium peltatum v. A. v. R., Handb. 632.

PERAK: Larut (Kunstler 2180).

Perfectly identical with specimens from Borneo. The rhizome of *P. sarawakense* Bak. (type in Kew!) is not naked as described by Baker, but clothed with easily deciduous almost orbicular blackish scales with brown edges, just as described by v. A. v. R. under his *P. peltatum*.

Polypodium regulare Mett., C. Chr., Ind. 558.

Gymnogramme campyloneuroides Bak., Journ. Linn. Soc. Bot., 24, 261. 1887.

Selliguea campyloneuroides Bedd., Handb. Suppl., 101.

Polypodium Hosei C. Chr., Ind. 534.

PAHANG: Sedagong, Pulau Tioman (Henderson 18895).

A comparison of the type-specimen of *P. regulare* Mett. (Borneo, Korthals, Herb. Leiden) and *G. campyloneuroides* Bak. (Sarawak, Hose 208, Kew) shows that they are absolutely identical. In his Handb. Suppl., p. 404, v. A. v. R. has reduced both *P. regulare* and *P. selliguae* Mett. (= *Selliguea membranacea*) to forms of *P. macrophyllum* Bl., and he may be right. In Ridley's paper this species is placed by error under *Syngamma* (p. 105).

Polypodium heterocarpum Bl., Fl. Javae, Fil., 167, pl. 75.

P. Zollingerianum Kunze; C. Chr., Ind. 575.

Pleopeltis Zollingeriana Moore. Ridley 93.

Nephrodium pteropodum Baker, Journ. Bot., 1888, 325.

Aspidium pteropodum Diels; C. Chr., Ind. 662

Polypodium Scortechinii Bak., Ann. Bot., 5, 477.

Pleopeltis Scortechinii Beddome, Handb. Suppl., 95.
Ridley 93.

I have examined both the type specimen of *N. pteropodum* Bak. from Sarawak (Kew!) and a co-type specimen of *P. Scortechinii* from Perak (Scortechini 216, Herb. Singapore) and find them perfectly identical. Both agree closely with Blume's figure of his *P. heterocarpum*, and I do not hesitate to reduce both names to synonyms of that species. According to modern rules of nomenclature this species must be named *P. heterocarpum* Bl.; *P. heterocarpum* (Bl.) Mett. (C. Chr., Ind.) must be called *P. Mettenianum* Cesati or *Selliguea heterocarpa* Bl.

Loxogramme subecostata (Hook.) C. Chr. comb. nov.

Polypodium subecostatum Hook., Spec., 5, 59, pl. 283 A.

Loxogramme Brooksii Copeland, Philipp. Journ. Sci., 9 C, 232. 1914; 11 C, 44, pl. 2 fig. 6. 1916.

PAHANG: Sedagong, Pulau Tioman (Henderson 18896).

An examination of the type-specimen of *P. subecostatum* Hook. in Kew from Sarawak, leg. Lobb, has shown that it is a genuine *Loxogramme*. Hooker's figure does not show the young linear submarginal slightly immersed sori, nor the velutinous roots so characteristic of this genus. *L. Brooksii* Copel. from Sumatra is certainly the same. It is probable that Ridley referred specimens belonging here to *L. lanceolata* (p. 104), under which name the specimen quoted was received. The species differs from *L. lanceolata* by its smaller size, much more coriaceous texture and the short sori being placed nearer the margin than the obscure midrib.

***Cyclophorus angustatus* Desv.**

To this species belong probably the sterile specimens from Perak (Kunstler 8275) referred by Beddome and Ridley (p. 98) to *C. heteractis* C. Chr., which species consequently is not known from the Peninsula.

***Cyclophorus varius* Gaud.**

C. pannosus Ridley 98.

SINGAPORE: Kranji (Ridley 6919, not 6419 as quoted by Ridley).

This specimen wrongly referred to *C. pannosus* by Ridley was rightly renamed *C. varius* by Holttum.

SCLEROGLOSSUM v.A.v.R.

This small genus was created by van Rosenburgh in 1912 (Bull. Jard. Buitenzorg, II S, XII, 39) and he referred to it three species: *S. debile*, *S. pusillum* and *S. sulcatum*, all previously considered species of *Vittaria*. The genus is very remotely, if at all, related to *Vittaria*, and forms with its sister-genus *Cochlidium* Klf. (*Pleurogramme* auctt.) of Tropical America, a distinct tribe of ferns, presumably of high age. The woody-coriaceous leaves, which are not articulated to the rhizome and apparently long-living, the peculiar light brown thin scales of the rhizome, hidden among the densely tufted leaves, lack of paraphyses, venation, and other characters make these species totally different from all *Vittariæ*. I shall discuss this genus in another paper, and here confine myself to mentioning briefly the species known from the Malay Peninsula. All species described are very closely related, and might naturally be regarded as forms of a single species.

***Scleroglossum debile* (Mett.) v.A.v.R., l.c.**

Vittaria debilis Mett.; Kuhn, *Linnaea*, 36, 67. 1869.

The smallest species; leaves rarely more than 3 cm. long, 1.5 mm. wide; veins simple; the sori short, near the

tip, not very deeply immersed, distinctly inframedial, the leaf edge outside the soral groove mostly broader than the costal parenchyma. Probably a small form of *S. pusillum*.

JOHORE: Gunong Panti (Holtum 17493). BORNEO.

Scleroglossum pusillum (Bl.) v.A.v.R., l.c.

Vittaria pusilla Bl. Ridley 108.

Leaves 5-10 cm. long, 3-4 mm. wide; veins forked or irregularly branching; sori in the upper third of the lamina, distinctly intramarginal, the inner edge of the soral groove acute and somewhat produced, the outer attenuate towards the edge and generally half as broad as the costal parenchyma. In specimens of this species one often finds scattered stellate brown hairs on the lamina; they are very deciduous and occur probably in all species.

MALACCA: Mt. Ophir (Ridley 9864). Singapore. Penang. Scattered through the Malayan region.

var. **intermedium** (Copeland)

Monogramme intermedia Copeland, Philipp. Journ. Sci., 1 Suppl., 255. 1906.

Intermediate between the type and *S. debile*, resembling the former in size, the latter by the inframedial sori with the leaf-edge beyond the soral groove about as wide as the parenchyma but thicker than in *S. debile*.

PERAK: (Scortechini). Philippines.

Scleroglossum crassifolium (Baker) C. Chr. comb. nov.

Vittaria crassifolia Baker, Kew Bull., 1893, 212.

V. sulcata Ridley, 108 (pro parte?)

Leaves up to 20 cm. long, 4-6 mm. wide, sometimes still larger, the upper half fertile, linear and generally narrower than the lower sterile half. Mouth of the soral groove marginal with the leaf edge not or very slightly protruding beyond the sorus. It is no doubt this form Ridley calls *V. sulcata*, which is a Ceylonese form with a distinct thick leaf-edge outside the sori; it is very doubtfully different from *S. pusillum*.

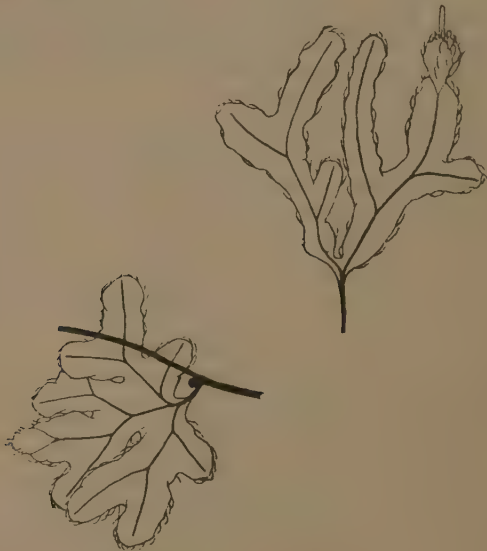
SELANGOR: (Ridley). BORNEO.

NEW SPECIES OF FERNS FROM THE
MALAY PENINSULA

By R. E. Holttum.

Hymenophyllum johorense Holttum, sp. nov.

Rhizoma tenue repens. Stipites 2-5 mm. longi, glabri. Frondes raro plus quam 1 cm. longae et 1 cm. latae; ramuli dichotomi fere regulariter; ramuli tertiarii plerumque praesentes, quaternati non visi. Ramuli ultimi 1.5-2 mm. lati, usque ad 9 mm. longi. Margines leviter crispatae, pilis simplicibus numerosis rufo-brunneis deciduis munitae.



Hymenophyllum johorense, x 2.5.

Valvae indusii extra pilosae, apice rotundatae, margine dentatae, dentes pilosi, basi angustatae et $2/3$ basin versus conjunctae; receptaculum tandem indusium longe 1 mm. superante.

JOHORE: Gunong Belumut, 3000 feet. (Holttum 10755), in a close mat on tree trunk, among liverworts.

Rhizome slender creeping. Stipes 2-5 mm. long, glabrous like the main veins. Fronds rarely more than 1 cm. by 1 cm.; branching almost equally dichotomous; branches of third order usually present, but of fourth order not seen. Ultimate branches 1.5-2 mm. wide, and up to 9 mm. long in unequally branched fronds. Edges slightly crisped, bearing numerous simple red-brown hairs, which are somewhat deciduous on old fronds. Valves of indusium with hairy outer surface, rounded above, and toothed, the teeth bearing

hairs like the edges of the frond; narrowed below and united for $\frac{1}{3}$ of their length, the base forming a conical sheath round the receptacle which in age projects 1 mm. beyond the indusium.

This is perhaps nearest to *H. borneense* Hk., of which I have seen the type at Kew. The latter species differs however in having more palmate fronds with more slender segments, which are very hairy, and the indusial lips are much smaller.

Leptochilus simplicifolius Holttum, sp. nov.

Rhizoma repens, squamis brunneis non-nitidis, lanceolatis, munitum. Stipites conferti, frondis sterilis 5-10 cm., fertilis 20-30 cm., longi, in sicco pallidi, glabri. Frondes steriles simplices, herbaceae, glabrae, 10-25 cm. longae, 3-5 cm. latae, lanceolatae, basi cuneatae, apice acuminatae, margine undulatae. Venae laterales 5-10 mm. distantes, leviter obliquae, fere rectae, subtus prominentes, pallidae, glabrae; venulae fuscae, aerolas irregulares 2-3-seriatis inter venas primarias formantes; venulae liberae paucae. Frondes fertiles 8-10 cm. longae, 1-2 cm. latae, irregulariter crenatae.

PAHANG: Robinson's Falls, Cameron's Highlands, 4500 ft., on wet rocks (Henderson 17977: type); Fraser Hill, 3800 ft., on rocks by stream (Holttum 11489).

PERAK: Gunong Hijau, 4200 ft. (Burkill 12756).

Rhizome creeping, scales dull brown, lanceolate. Stipes closely placed, 5-10 cm. long in sterile fronds, 20-30 cm. in fertile fronds, slender, pale when dried, glabrous. Sterile fronds simple, 10-25 cm. long, 3-5 cm. wide, lanceolate, base cuneate, apex acuminate, edge undulate; lateral veins pale, prominent beneath, 5-10 mm. apart, slightly oblique, almost straight, glabrous. Veinlets dark, forming 2-3 rows of aerolae between the main veins with very few free included veinlets. Texture herbaceous. Fertile fronds 8-10 cm. in length, 1-2 cm. in width, rather irregularly crenate. Sori completely covering lower surface.

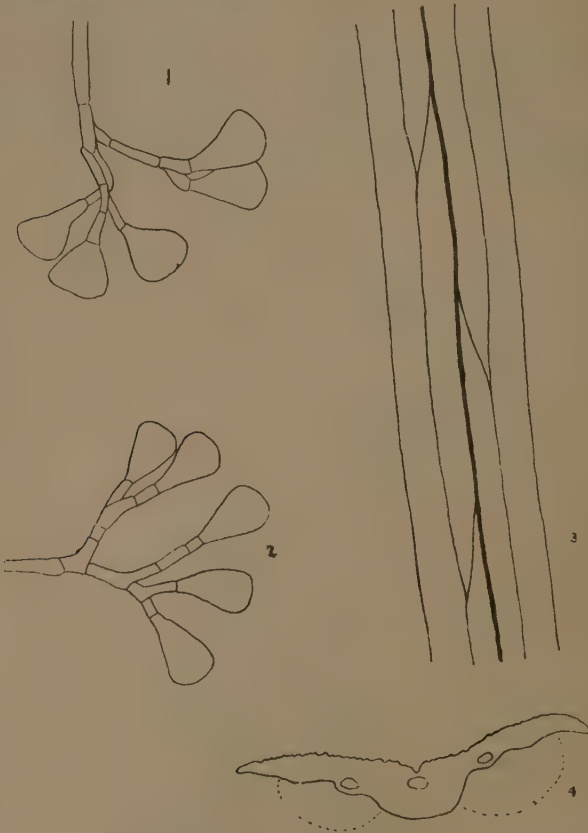
Nearly allied to *L. heteroclitus* (Pr.) C. Chr.

Vittaria (*Taeniopsis*) **malayensis** Holttum, sp. nov.

Rhizoma breve repens, squamis angustis fuscis clathratis setosoacuminatis vestitum. Frondes confertae, sessiles, usque ad 25 cm. longae et 2 mm. latae, basin versus semisim contractae. Costa supra canaliculata, subtus leviter prominens. Venae laterales duae, sub soris, cum costa parallalae. Venulae paucae, obliquae, cum venis lateralibus confluentes. Venulae liberae nullae. Sori lati, paulo immersi inter costam et marginem, $\frac{2}{3}$ partem superiorem frondium occupantes, continui vel interrupti. Sporangia paraphysibus ramosis clavatis intermixta.

PAHANG: Fraser Hill, 4000 ft. (Burkill & Holttum 8705 (type), E. Smith 891); Cameron's Highlands, 4800 ft.

(Henderson 17702); Gunong Berumban, 5500 ft. (Henderson, F.M.S. Mus. No. 11744).



Vittaria malayensis. 1 & 2, paraphyses, x 100. 3, venation, x 6. 4, transverse section of frond, showing position of sori, x 20.

Rhizome short-creeping, densely covered with narrow dark hair-pointed clathrate scales. Fronds closely placed, sessile, to about 25 cm. long and 2 mm. wide, very gradually narrowed to base. Midrib grooved above, slightly prominent beneath. Veinlets few, forming a single row of long aerolae between the midrib and a continuous vein lying below the sorus. No free veinlets. Sori in shallow grooves, occupying most of the space between midrib and edge, on the upper $\frac{2}{3}$ of the frond, continuous or interrupted. Sporangia mixed with numerous branched paraphyses, the branches capitate. Spores about 64 to a sporangium. Stomata occur on the lower surface, on either side of the grooves occupied by the sori.

ADDITIONS TO THE FLORA OF THE MALAY PENINSULA.

STERCULIACEÆ.

Sterculia alata, Roxb. Hort. Beng. 50; Pl. Corom. iii, 84. t.287.

Kelantan, Gua Panjang at Gua Ninik, Henderson 19613; Perak, no locality, Scortechini 1783; Negri Sembilan, Senawang Reserve, Forest Department 1995.

Helicteres lanceolata, DC., Prod. i, 476.

Pulau Langkawi, Holtum 17430, August, 1925.

MELASTOMACEÆ.

Sonerila johorensis, Hend., sp. nov.

S. prostratae Ridl. affinis, sed foliis, antheris, petalisque majoribus differt.

Prostrate creeping herb, rooting at intervals, stems filiform, red with long white hairs. Leaves in subequal pairs, broadly triangular ovate acute, serrate, base broad and abruptly narrowed into the petiole, red below when alive, purplish when dry, white hairy above and below; up to about 15 mms. long and 10 mms. broad; petioles about 2 mms. long.

Flowers 2 to 4 on a terminal peduncle 2-3 cms. long. Calyx narrowly funnel shaped, 4 mms. long, teeth broad, acute. Petals pink, 6-8 mms. long, ovate oblong apiculate. Stamens 3, anthers yellow, curved, acuminate, 2 mms. long, filaments slender 3 mms. long. Capsule smooth or minutely hairy, cylindric oblong, narrowed at base, 5-6 mms. long.

JOHORE, Gunong Panti at 1600 ft. altitude, on rocks, Holtum 17500 (type), Feb. 1926.

RUBIACEÆ.

Pomazota rivularis, Hend., sp. nov.

A *P. sylvestre* Ridl., foliis maioribus minus hirsutis, stipulis latioribus, corolla cylindrica, stylo tenuiore differt.

A creeping and erect herb, woody at base, stems at base as much as 8 mms. through, rooting at lower nodes.

Leaves oblong-lanceolate or oblanceolate, acute, narrowed to base, up to 18 cms. long and 6.5 cms. broad, glabrous above except for a few coarse thick hairs between the nerves, sparsely hirsute below on the midrib and nerves, margin with a row of multicellular hairs. Nerves prominent on both sides, up to 17 pairs. Stipules broad triangular-ovate with long points.

Peduncles variable in length, reaching 6 cms., subtended at base by a pair of ovate acute bifid bracts hairy on their edges. Involucral bracts broadly oblong or rhomboid, 3-nerved, sparsely hairy, up to 2 cms. long and 1 cm. broad. Outer floral bracts narrow spatulate, 6-8 mms. long with long multicellular hairs. Inner floral bracts linear oblong,

also hairy. Calyx lobes 4, narrow oblong with long multicellular bristles on their edges. Corolla white, cylindric, 4 mms. long, constricted below the lobes, mouth with a dense ring of hairs; lobes 4, patent, triangular ovate, with a strongly marked midrib from which arise two or three multicellular bristles. Stamens 4, about half the length of the corolla tube, anthers oblong. Style slender, stigma large globose, prolonged below the insertion of the style into two lobes. Disc conspicuous.

Capsule ovate oblong 2-3 mms. long, crowned by the persistent calyx lobes. Seeds small, numerous, angular, punctate.

JOHORE: Gunong Muntahak, c.600 ft., by a stream in dense shade, abundant, Holttum 19922 (type), March, 1928.

COMPOSITÆ.

Eupatorium conyzoides, Vahl, Sym. Bot. iii, 96.

A Brazilian composite of recent introduction into the Peninsula, now common on roadsides near Taiping.

LOGANIACEÆ.

Fagraea speciosa, Bl. Rumphia ii, 35, t. 81.

Kelantan, Sungai Keteh at Gua Ninik, Henderson 19658, October 1927.

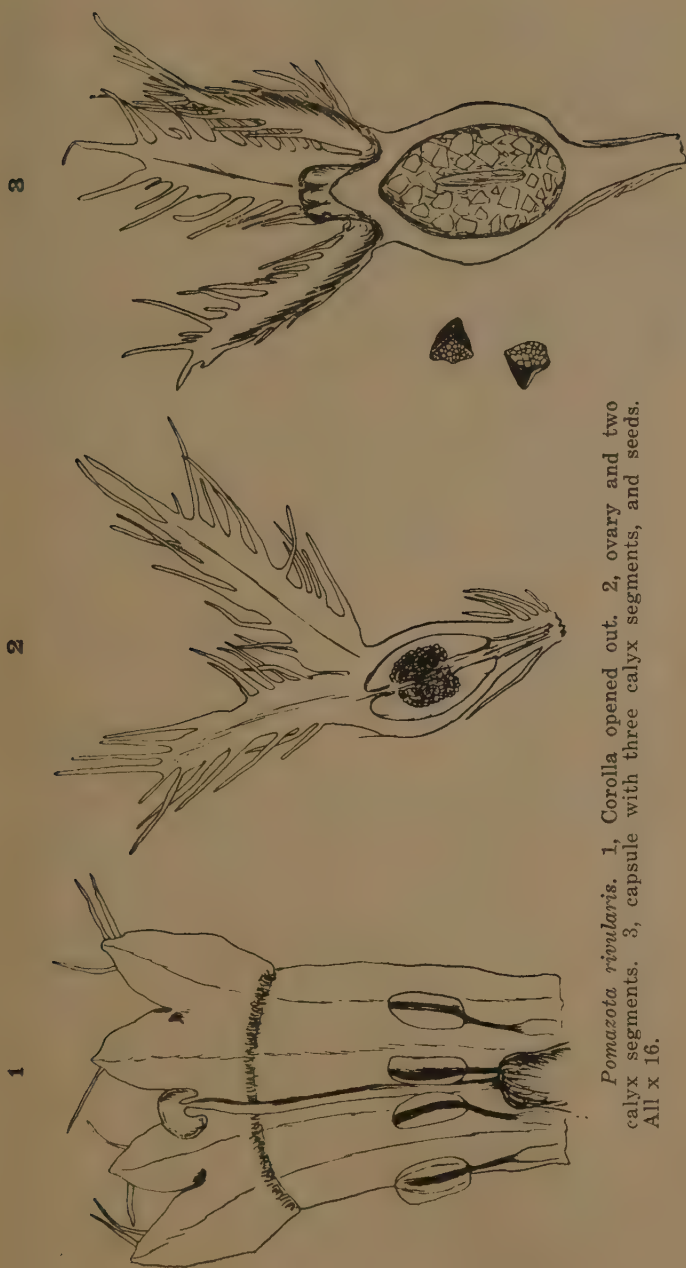
GESNERACEÆ.

Loxocarpus Holttumi, Hend., sp. nov.

L. semitortae Ridl. affinis, foliis cordatis, latioribus, pedunculis longioribus, calycis majoribus, pedunculis floribusque extra glanduloso-hirtis differt.

Leaves in a rosette, broadly ovate, cordate, blunt, edge serrulate, upper surface covered with white silky hairs, lower surface densely covered on the prominent veins with long slender ferrugineous hairs, between the veins more sparsely covered with short white hairs; about 4-5 cms. long and 4 cms. broad. Petioles up to 5 cms. long, densely ferrugineous hairy.

Peduncles to 15 cms. or more, covered with short purple glandular slightly viscid hairs, pedicels drooping, 1.2 cms. long. Inflorescence of about 7 flowers. Sepals triangular, blunt, 1 mm. long, hairy as the peduncle and pedicel. Corolla uniformly pale mauve-blue, slightly paler at the base, two-lipped, lobes round blunt, the two upper lobes much smaller than the three lower ones; 13 mms. long and broad. Outside of corolla sparsely white glandular-hairy. Filaments rather slender, curved, white to greenish, anthers yellow, or the same colour as the corolla, connivent. Staminodes white, club-shaped, about one-third the length of the stamens.



Pomazota rivularis. 1, Corolla opened out. 2, ovary and two calyx segments. 3, capsule with three calyx segments, and seeds. All x 16.

Capsule conic, dehiscing along the upper edge, sepals persistent, reflexed. Seeds brown, narrowly ovoid and pointed at both ends, minutely reticulate.

JOHORE, Gunong Panti at 1600 ft. altitude on rocks, Holttum 18097 (type), Feb. 1926; same locality, Holttum 19863, Dec. 1927.

ORCHIDACEÆ.

Eria rigida, Bl. Mus. Bot. Lugd. Bat. ii, 183.

Pahang, Gua Tipus near Chegar Perah, Henderson 19465, Oct. 1927.

Eria Teysmanni, J. J. Smith in Bull. Dép. Agric. Indes Néerl. xxii, 29.

Kelantan, Kuala Pertang, Haniff and Nur 10364, February 1923.

M. R. Henderson.

FURTHER ADDITIONS TO THE FLORA OF THE MALAY PENINSULA.

(1) *HYPTIS CAPITATA*, Jacquin in *Collectanea I* (1786) 102.

Pycnanthemum decurrens, Blanco, in *Flor. Filip. Ed.* 3, II (1878) 251, t. 294.

A stout annual herb, erect, 4 feet tall, hairy, green, or purplish especially at the nodes and in the upper side of the leaf-mid-veins, with four-angled stem. Leaves lanceolate, toothed, about 4 inches long, and 1 inch broad. Flowers numerous, crowded into subglobose heads, on long peduncles, peduncles solitary, axillary, four-angled, about 3.5 inches; heads 0.5 to 0.7 inch long. Calyx pale green. Corolla white, dotted pink in the tube, inferior lip yellowish white. Stamens exsert; filaments white; anthers darkish; pollen yellow. Style linear, white, exsert.

This plant is quite common in waste places along the Cluny Road, in the vicinity of the Old Arboretum of Singapore, and has been observed there for the last five years. The plant agrees well with plate given in Blanco's *Flora*, l.c.

Distribution—A plant of Mexican origin now found as a weed in the Marianne and Caroline Islands, the Philippines, Formosa, Amboina, Java, Borneo and India.

The key given in Ridley's *Flora II* (1923) 645, for the identification of *Hyptis* spp. occurring in the peninsula may be modified to include the above species thus:—

A. flowers few in racemose cymes, corolla violet; herb strongly aromatic, pubescent with spreading hairs; leaves ovate, serrulate. *H. suaveolens*, Poir.

AA. flowers numerous in axillary globose or subglobose heads, corolla white; herb little or not aromatic, more or less pubescent with non-spreading hairs; leaves ovate-oblong to lanceolate, serrate:

(a.) Peduncles about 0.5 inch long, more or less as long as the flower heads. *H. brevipes*, Poir.

(aa.) Peduncles 3.5 inches long, about three or more times as long as the flower heads. *H. capitata*, Jacq.

(2) *RIVINIA HUMILIS*, Linn. *Spec. Plant.* (1753) 121; H. Walter in *Engl. Pflanzenreich IV* 83 (1909) 102, fig. 30; Sims in *Bot Mag.* (1816) t. 1781.

Perennial herb or shrub, woody below, up to 3.5 feet tall, glabrous or pubescent. Leaves alternate, occasionally sub-opposite, entire, ovate or broadly elliptic, apex long acuminate, base rounded or obtuse, sometimes slightly acute or sub-cordate, 1 to 4 inches long, 1 to 2 inches broad; petiole more or less hairy or tomentose, roundish, with a little groove above, 1 to 1.5 inch long. Flowers bisexual in subterminal or axillary racemes, little longer or shorter than the leaves.

Perianth of a single series, 4 cleft, white or pinkish, 1 1/2 inch long, increases and turns green in fruit. Stamens as many as perianth segments; filaments white, persisting green on fruits. Ovary monocarpellary, white, style one, short with capitate, white stigma. Fruit a globose red berry, with fleshy pericarp; seed hard, black.

Varieties occurring here *orientalis* (Moq.) Walt. and *canescens*, L.

As early as the year 1890 (or 1896?) Ridley collected a specimen of this species which was then noted by him as an escape from the Singapore Botanical Gardens. This species is still found persisting as weed in the Garden's hedges and is seen flowering and fruiting throughout the year. The other records for the Peninsula are:—

Malacca at Malacca Hill (Ridley, Dec. 1899). Singapore, Yo Chu Kang (Ridley, 1902); Paya Goyang (Hassan, May, 1905).

Singapore, (Mayer, no. 884 fide Walter l.c.) [Mayer's name is not included in the list of Malayan Plant Collectors made by Burkill and published in Garden's Bulletin IV (1927) nos. 4 and 5].

Distribution—Native of tropical and subtropical America, but now pantropic.

Rivina (also spelt as *Rivinia*) is a Linnean genus of the *Phytolocoaceae*—a family not included in Ridley's *Flora*.

For the purpose of tracing the family of this plant, the following synopsis may be used as an Addendum to the synopsis of the families given by Ridley in the *Flora*, I (1922) xxxi:

CXa—*Phytoloccaceae*—Herbs or shrubs, woody at base. Perianth of a single series, 4-cleft. Leaves alternate, entire. Ovary of one carpel. Style one, capitate stigma. Fruit a berry.

C. X. FURTADO.

OCIMUM, LINN. IN THE MALAY PENINSULA.

In the peninsula all *Ocimum* species are cultivated plants, but frequently one comes across them as escapes and weeds in the settled areas. They are grown chiefly for the purposes of worship or for their medicinal value, or again for the purpose of scenting cooked preparations. *O. sanctum*, L., is sacred to the Hindu deities Krishna and Vishnu, and is frequently cultivated by the Hindus from northern India near their dwellings, in places where they usually say their prayers. Some believe that the mere presence of the *Ocimum* round about the houses keep away mosquitoes. An infusion of its leaves is used, either alone or mixed with that of other plants, internally to cure the minor disorders of the respiratory system and also irregular

menstruation in women, and externally as a cure for skin diseases, headache and earache. Medicinally leaves of any of the *Ocimum* species are considered good, but leaves of *O. sanctum*, L. and *O. Basilicum*, L. are regarded as superior to others. Leaves of *O. canum*, Sims, and of the white-flowered, hairy varieties of *O. Basilicum*, L. are used in culinary preparations. The leaves and calyces of *O. Basilicum*, L. var. *pilosum*, Benth. has been reported to be a frequent adulterant of the patchouly (*Pogostemon Cablin*, Benth.) prepared for export from this country. [Gildemeister & Hoffmann in the *Volatile Oils* Engl. Ed. (1900) 657; and Prain in *Journ. As. Soc. Bengal* LXXIV pt. 2 Extra No. (1907) 702 & 709]. In his notes on the Malayan drugs, Ridley notes that the flowers of *O. Basilicum*, L. form one of the ingredients used in the root decoction of *Phyllanthus Niruri*, L. given to cure cough in children, and that an infusion of the seeds of *O. gratissimum*, L. is drunk for gonorrhea, and also in the morning as laxative. (*Agri. Bull. S.S. & F.M.S.* V, -1906-248 & 278.)

Being introduced plants in the peninsula, the Malays have no fixed vernacular name for the *Ocimum* species. *Kemangi* is the usual name for *O. canum*, Sims, but it may also be used for the white-flowered varieties of *O. Basilicum* that are used in cooking. *Selasi* or *Selaseh*, a corruption of the Sanskrit name *Tulasi* for the *Ocimums*, *Pokoh* derived from the Chinese name *Poh Hok* for peppermint, and *Ruku* are used indiscriminately to all the species of the *Ocimum*, but rarely to *O. canum*, Sims. The last two names are usually used in the plural form as *Ruku-Ruku* and *Pokoh-Pokoh*, the singulars being seldom used. As in the Malay language the plural form, when applied to plants, usually implies that the plants bear in some way a resemblance to the one to which the singular belongs, the genuine *Ruku* may be some other plant native of Malaya, as for instance, the aromatic *Adenosma capitatum*, Benth., which is now known to the Malays as *Ruku hutan*. The word *Kemangi* is usually used alone, but all the others may be applied alone or with the adjective *merah*, *hitam*, *puteh* or *besar* to describe the general size or colour of the plants in the living condition. *Oku* or *Oku-Oku*, are apparently corruptions of the *Ruku* or *Ruku-Ruku*. The white-flowered, hairy varieties of *O. Basilicum*, L., approach so near to *O. canum*, Sims, that botanically it is very difficult to separate them as distinct species except by the larger size of all the parts of *O. Basilicum*, L. The Malays also do not seem to make any difference between them, and the varieties of *O. Basilicum*, L. have the same vernacular name and uses as *O. canum*, Sims. All the above names are also applied by the Malays to *Hyptis suaveolens*, Poir, another aromatic plant of foreign origin belonging to the same family as the *Ocimums*. The most usual adjective that accompanies the

names in this case is *hutan* to show that the plant is a weed or wild in the Peninsula.

The key and the descriptions of *Ocimum* species given by Ridley in the *Flora of the Malay Peninsula* II (1923) 643, are not very satisfactory for the identification of the species occurring in the peninsula, and hence the key given below has been prepared after a study of the plants in the herbarium as well as in the living condition.

KEY.

1. a. Shrubby plants 1 to 2 m. tall. Leaves more than 7.5 cm. long, 5 cm. wide, broadly serrate. Lower calyx lip shorter than the upper one. Corolla white, pubescent....
.....*O. gratissimum*.

b. Herbs or woody undershrubs, 30 to 100 cm. tall. Lower calyx lip longer than the upper one. Leaves usually less than 6.5 cm. in either dimensions, entire or serrate
..... (2)

2. a. Leaves somewhat rhomboidal, obtuse, often apiculate, hairy on both sides. Pedicels as long as, or longer than, the calyx, spreading out almost at right angles to the axis so that the calyces face outwards. Calyx glabrous within. Stem often reddish pubescent with spreading, white hairs. Corolla purplish, pink or white with purplish or pink lobes, or yellowish lip (fide Ridley) Anthers yellow
.....*O. sanctum*.

b. Leaves acute or acuminate at both ends, rarely with an obtuse apex. Pedicel shorter than the calyx, growing upwards closely adpressed to rachis so that the calyces on decurved tips face downwards and appear sessile. Calyx hairy within; patellate lobe obstructs the view of the remaining parts. Anthers white..... (3)

3. a. Corolla white, 4 to 5 mm. long. Patellate lobe of the calyx 2.5 to 4 mm. long and as much broad. Leaves 2.5 to 4 cm. long, acute at both ends or rhomboidal. Plant pubescent often densely in the upper parts, low branched, 30 to 45 cm. rarely 60 cm. tall herbaceous, whitish without any purplish tints.....*O. canum*.

b. Corolla white, purplish or pink, 7.5 to 12 mm. long. Patellate lobe of the calyx 5 to 7 mm. long, 6 mm. broad. Leaves 2.5 to 7.5 cm. long, very variable, usually lanceolate, cuneate at base, or hairy glabrous plant 45 to 90 cm. tall, branching in the upper two-thirds, bushy, sometimes hairy but usually glabrous, and purple with dark purplish tints even in the calyx.....*O. Basilicum*

(Polymorphous species).

O. gratissimum, Linn.

Lower Siam, Kopah (Haniff & Nur, n. 2987) Perak, Sungei Siput (Haniff & Nur, n. 6923) Singapore, Botanic

Gardens, (Ridley, in 1905; Deshmukh, in 1921; Furtado, in Nov. 1927, known in the vernacular as *Ruku-Ruku hitam*, and *Selaseh besar*).

O. sanctum, Linn.

Langkawi, (Curtis, n. 2126). Perak, Matang, (Wray, n. 558, as Selassay). Province Wellesley, Pagar Tras, (Ridley, n. 7168); Prai, (Nur, n. 6226). Pahang, Pekan, (Ridley, as Selaxa antan and no. 187); Kuala Tahan, (Seimund, n. 831). Malacca, Gombeya Bath, (Hervey, Sept. 1890). Selangor, Kuala Lumpur, (Ridley, n. 10214); Port Swettenham, (Burkill, n. 2700). Johore, Pulau Tingii, (Burkill, June 1915, as Oku). Singapore, (Hullett, in Nov. 1884 n. 374; Ridley, in 1903, as Ruku-Ruku); Pulau Ubin, (Furtado, n. 18622); Botanic Gardens (Furtado, Nov. 1927, as Selaseh hitam and Ruku-Ruku merah).

O. canum, Sims.

Langkawi, (Curtis, n. 2492). Perak, Kuala Kangsar, (Haniff n. 14930) Singapore, (Hamilton, in Oct. 1926, as Kemangi); Botanic Gardens, (Ridley, in Aug: 1898; Furtado, in Aug: 1928, as Kemangi). This plant frequently appears for sale in the Singapore bazars, as also the white-flowered hairy varieties of *O. Basilicum*, L. known to the Malays as the Kemangi.

O. Basilicum, Linn.

Penang, Tanjong Tokong, (Curtis, n. 2492); Waterfall Gardens (Nur, in Sept. 1918) Selangor, Kuala Lumpur, (Ahmat in 1889, as Kemangi). Pahang, Kuala Tembeling, (Ridley, in Aug: 1891); Pulau Tioman, (Henderson, n. 18428). Malacca, Bukit Panchur, (Alvins, as Ruku-Ruku Itam). Singapore, (Ridley, in 1903, as Selasih); Bukit Mandai, (Ridley, as Ruku-Ruku); Botanic Gardens, (Furtado, in Nov. 1927, as Selaseh puteh, Selaseh hitam, Pokoh, Pokoh-Pokoh hitam, and Kemangi).

C. X. FURTADO.

PALAEQUIUM STELLATUM, KING & GAMBLE.

PALAEQUIUM STELLATUM, King & Gamble in *Journ. As. Soc. Bengal* LXXIV, pt. II (1905) 198; Ridley in *Flor. Mal. Pen.* II (1923) 277; and H. J. Lam in *Bull. Jard. Bot. Buitz.* VII (1925) 71 and VIII (1927) 402.

Bassia Watsoni, Ridley l.c. p. 267.

Madhuca Watsoni (Ridl.) Lam l.c. VII (1925) 179 and VIII (1927) 462.

In the *Materials for a Flora of the Malayan Peninsula*, King and Gamble (l.c.) used Scortechini's specimens numbered 1855, from Perak, to found a new species which they called *Palaquium stellatum*. The specific name for the plant was suggested by Scortechini himself who

thought the hairs on the leaf-nerves were stellate. Having probably no occasion to test the accuracy of Scortechini's observations regarding hairs on the leaf nerves, King and Gamble retained the specific name suggested by the Schortechini whom they also held responsible for the description of the hairs. A co-type specimen of the number cited by King and Gamble is in the Singapore herbarium. It answers to the description of the species in all respect except the hairs on the leaf-nerves, which are not stellate. In his monographic work on the sapotaceous plants of the Dutch East Indies, the Malay Peninsula and the Philippines, Lam points out this error in the description of the hairs on the leaf-nerves of *P. stellatum*, and adds that he has never come across a *Palaquium* species having stellate hairs on leaves (Lam, l.c. VII, p. 71). Hitherto *P. stellatum* was believed to occur in the Malay Peninsula only, and to be very rare. But from the citations given by Lam (op. cit. VII, p. 71, and VIII p. 402) one notes that it is not so rare in the Peninsula, and that it also occurs in Sumatra.

In working out the sapotaceous plants for his Flora, Ridley was not able to see the type specimen of *P. stellatum*, and so he borrowed the specific description for the Flora from the original description in the Materials (Ridley, l.c. p. 277). He had, however, with him unnamed material of this species, which he used to found his *Bassia Watsoni* (l.c. p. 267). He does not cite the numbers of the type specimens, but thanks to Mr. Burkill who has looked them up at Kew, we know that the type specimens of *Bassia Watsoni*, Ridley, are C. F. nos. 869 and 2755, both of which numbers are represented in the Singapore herbarium. An examination of this material leaves no doubt that it is *Palaquium stellatum*, King and Gamble, though the leaves resemble somewhat of the *Bassia* group. The calyx is distinctly of six sepals, and Ridley himself had noted correctly that the outer whorl consists of three sepals, whereas the *Bassia* (*Madhuca*) species have two sepals in the outer whorl of the calyx. The cotype specimens of *Bassia Watsoni* in the Singapore herbarium closely agree with the type specimen of *Palaquium stellatum* and with its description as corrected by Lam.

While working on the sapotaceous plants in Malaysia, Lam (op. cit) could not see any authentically named specimen of *Bassia Watsoni*. But considering that the generic name *Madhuca*, GMELIN, is the only valid name for the *Bassia*, KOENIG, the word *Bassia* being preoccupied by ALLIONI for a group of Chenopodiaceae, he renamed *B. Watsoni*, Ridley as *Madhuca Watsoni* with a note indicating his doubts of its being a true *Madhuca* (op. cit. VII, p. 179). Later on he had with him a specimen collected by Watson at Baloh Reserve, numbered C. F. 2755, which he determined

correctly as *Palaequium stellatum* (l.c. VIII, p. 402); but he did not know that this was from the type collection cited by Ridley for *Bassia Watsoni*. Lam, therefore, still retained the name *Madhuca Watsoni* in this later publication with a note that he has not seen any specimen of the species. (l.c. VIII, p. 462).

C. X. FURTADO.

SPECIES OF NEESIA IN THE MALAY PENINSULA.

The primary object of this note is to restore to its proper rank, the species *Neesia synandra*, Masters, the specific status of which has long been in doubt, and also to show the limits of distribution of all the three species found in the Malay Peninsula. That Masters had made a careful examination of the type specimen of his species is quite clear from the generic characters given by him under *Neesia* in Hook f. Flor. Brit. Ind. I pt. 2 (1874) 352, which, as far as the leaves and flowers were concerned, were all a result of his own observations made of the type specimen of his species. But the confusion occurred owing to a mistake he made in giving almost all the important characters of his species under the generic description, where they escaped the attention of the botanists who tried to study his species, giving the minor ones under the description of his species. It was probably his intention to show the characters of the genus *Neesia* as he had found it in the Malay Peninsula; for he was fully aware that his generic description was not applicable, at least in the characters of the filaments, to *Neesia altissima*, Bl., the only other *Neesia* species known then; in fact he himself draws attention to this fact under the description of his species. The result of the transference, which Masters unwittingly made, of the important specific characters to the generic description was that *Neesia synandra*, Mast., was either regarded as a doubtful species, or confused with others quite distinct. Hence a detailed description of *Neesia synandra*, Mast., and a sufficient synonymy of all the three species occurring in the peninsula together with an artificial key are given below so as to make their distinctions and their specific ranks quite clear.

KEY.

1a. Leaves up to 24 x 12 cm., glabrous, with 12–15 pairs of nerves. Flowers in the axils of fallen leaves. Peduncle 0.2 cm. thick, pedicels 1–2 cm. long. Calyx globose in the bud abruptly contracted towards the apex, later somewhat compressed with margins inflexed inwards, not involute
.....*Neesia malayana*.

1b. Leaves over 30 x 15 cm. glabrous to distinctly hairy beneath, with 18–26 pairs of nerves. Flowers axillary, or in the axils of fallen leaves. Peduncle 0.3–0.4 cm. thick;

pedicels up to 1 cm. long. Calyx globose in the bud contracted or not towards the apex, later saucers shaped with margins involute or not.....(2)

2a. Leaves up to 45 x 17 cm. glabrous or subglabrous. Branchlets and petioles hairy or glabrous, rarely covered with a few scales. Stipules glabrous, subglabrous or rarely with a few scales. Flowers axillary or in the axils of fallen leaves. Calyx globose in the bud abruptly contracted towards the apex, later saucers shaped with involute margin, wholly or partly pubescent within.....*N. altissima*.

2b. Leaves over 45 x 20 cm. distinctly hairy beneath. Branchlets and petioles scaly, not hairy. Stipules thickly covered with scales outside, tomentose within. Flowers in the axils of fallen leaves. Calyx globose in the bud with cuneate apex, later convexly saucers shaped with margin spreading, not involute, glabrous within.....*Neesia synandra*.

Neesia synandra, Masters in Hook. f. Flor. Brit. Ind. I pt. 2(1874) 352; Mast. in Journ. Linn. Soc. Bot. XIV(1875) 504; Becc. Malesia III (1889) 263; King Mat. Flor. Mal. Pen. in Journ. As. Soc. Beng. LX, pt. 2(1891) 56, reference to Maingayi's specimen only; Ridl. Flor. Sing. in Journ. Roy. As. Soc. Str. Br. XXXIII(1900) 51 pro parte; Ridl. Flor. Mal. Pen. 1(1922) 265 pro parte; Merr. in Journ. Roy. As. Soc. Str. Br. LXXXVI(1922) 328?

Arbor c. 20 m alta, 60–70 cm. diametro. Ramuli crassi, tereti, inferne delapsu foliorum conspicue cicatrisati, glabri, superne foliosi, lepidoti. Folia alterna, petiolata; stipulis deciduis, foliaceis, sessilibus, lanceolatis uni vel obsolete multi-nerviatis, 5 cm. longis, extus squamatis, intus tomentosis; petiolo usque 10 cm. longo, 0.7 cm. crasso, lepidoto, terete, basi dilatato trigono, apice inflato; lamina adulta 45–55 cm. vel magis longa, plus 20 cm. lata, coriacea obovato-oblonga, basi attenuata, saepissime cordulata, raro rotundata, apice semper emarginata, margine integra subundulata supra glabra costis nervisque sparse pilosis exceptis, subrugosa, dense punctulata, subtus aspera, pilosa, costis nervisque lepidotis exceptis; juvenilis utrinque dense tomentosa subtus costis nervisque lepidotis exceptis; nervis (lateralibus) 20–24 parallelibus, prope marginem arcuatis, in pagina superiore depressis, inferiore valido-prominentibus. Inflorescentia subterminalis, ad axillas foliorum delapsorum, corymboso-multiflora divaricata, usque 3.5 cm. longa. Pedunculi ad singulum pulvinum 1–3, ramosi, densissime squamati, angulati, basi 0.4 cm. crassi; bracteis minimis (0.3 cm. longis), densissime lepidotis, caducissimis. Pedicelli usque 1 cm. longi, angulati, densissime lepidoti. Involucellus trilobatus, caducus, extus lepidotus, intus glaber. Calyx primum globosus, apicem

versus sensim angustatus, sub anthesi convexo-disciformis margine obsolete crenulato, haud fisso, haud involuto, extus squamis densissime obtectus, intus glaberrimus, circiter 1–1.5 cm. diametro, persistens. Corolla pentapetala, petalis liberis, contortis, in calyptram cohaerentibus, mox deciduis, utrimque obtusis, extus basi glabro excepto timentosis, intus glabris, 1 cm. longis, 0.4 cm. latis. Stamina numerosa ($\pm$ 20–30), monadelpha, in 5 acervos obsolete divisa, quam corolla breviora, omnia fertilia; filamentis ad medium connatis; antheris extrorsis, bilocularibus visu. Pistillum stamina superans, 0.7 cm. longum; stylo brevi, tereti, glabro; stigmate crasso, capitato secus marginem minute puberulo; ovario subsessili, quinqueloculari, oblongo, ciliato. Fructus pedunculatus; immaturus quinquangularis obovatus basi apiceque obtusus, pyramidato-tuberculatus; submaturus partim virescens partim purpurascens, muricatotesselatus, quinquejugatus, sectione transversa stellatus, 15 cm. longus, ellipticus, apice obtusus, ima basi acutus; maturus ad angulos prominentes ad apicem valvatim dehiscens; valvis 5, lignosis, medio septiferis, basi connatis, superne hiantibus, extus lividis, intus pilis rigidis prurientibus luteis densissime tectis, ad margines axiales plures semines utrimque ferentibus; seminibus ellipsoideis, apice obtusis, basi cuneatis, horizontalibus, nudis, nigris, usque 2 cm. longis, 1 cm. crassis. Indumentum pro magis parte stellulatum. Squamae peltatae.

Tree about 20 metres tall, 60–70 cm. through. Branchlets thick, terete, marked with conspicuous scars of fallen leaves, glabrous, but covered with scales in the terminal leaf-bearing parts. Leaves alternate, petioled; stipules deciduous, foliaceous, sessile, lanceolate, one or obscurely many-nerved, 5 cm. long, scaly outside, tomentose inside; petiole up to 10 cm. long, 0.7 cm. thick, scaly, terete, dilated trigonal at base, inflated at apex; adult leaves 45–55 cm. or more long, more than 20 cm. broad, coriaceous, obovate-oblong, narrowed into a very often cordulate, rarely obtuse, base, always with an emarginate apex, with entire, slightly undulate margin. Glabrous above except for a few hairs along the midrib and nerves, and minutely and thickly punctate; in the under surface rough and hairy except for the scaly midrib and very often scaly nerves; nerves (lateral) 20–24 pairs, parallel arched near the margins, sunk above, raised beneath. Corymbs many-flowered, divaricate, sub-terminal, in the axils of fallen leaves, up to 3.5 cm. long. Peduncles 1–3 on each pulvinus, branched, densely covered with scales, angled, 0.4 cm. thick at base; bracts small (0.3 cm. long), thickly covered with scales, caducous. Pedicels up to 1 cm. long, angled, thickly lepidote. Epicalyx trilobed, caducous, scaly outside, glabrous within. Calyx globose in the bud, with gradually cuneate apex, later dilated and compressed into a convex disc with obscurely crenulate, but

not split nor involute, margin, thickly coated with scales outside, glabrous within, about 1–1.5 cm. in diameter, persistent. Petals 5, contorted, free but cohering together, deciduous, obtuse at base and apex, 1 cm. long, 0.4 cm. wide. Stamens numerous (+ 20 to 30) monaldehyous, but obscurely arranged in 5 bundles, shorter than the corolla, all fertile, each bundle alternate with the petals, divided half-way into numerous filaments; anthers apparently all bilobed, extrorse. Pistil longer than the stamens, 0.7 cm. long; style short, terete, glabrous; stigma thick, capitate, minutely puberulous along the margins; ovary subsessile, oblong, 5-locular, ciliate with long persistent hairs; ovules numerous 2-seriate, horizontal, anatropous. Fruit peduncled; very young pentagonal, obovate obtuse at base and at apex, covered with pyramidal spines all over; half-ripe fruits partly green and partly purplish faintly suffused with blue, muricate-tessellate, 5-ridged, star-shaped in transverse section, 15 cm. long, elliptic, obtuse at apex, cuneate at the very base; ridges 6 cm. high from the axis of the fruit, the furrows 2.5 cm. deep; mature fruits open along the ridges into 5 valves; valves woody, carrying the septum in the middle, united at the base, opened at apex, blue-black outside, densely covered within with rigid, stinging, yellow hairs; seeds many, borne horizontally on both sides along the axial margins of the valves, ellipsoid, obtuse at apex, cuneate at base, smooth, naked, black, up to 2 cm. long, 1 cm. thick. Hairs on the vegetative parts of the plant mostly stellate; scales always peltate.

PENANG, Sungei Telok Bahang (Burkill, n. 4556, flrs. in Feb. 1919); Telok Bahang, (Forest Guard under Curtis, n. 3081 leaves only); Penara Bukit, (Forest Guard under Fox, flrs. in March 1905).

SELANGOR, Weld Hill in Kuala Lumpur (Hamid no. C.F. n. 2301 leaves only).

SINGAPORE, Bukit Timah, (Ridley, flrs. and very young fruits in Feb. 1890; ripe fruits in Oct. 1904 and Sept. 1908; Holttum & Furtado, n. 19788, flrs. & fruits in all stages in Nov. 1928).

Distribution—Borneo?

I have not seen the Bornean specimen referred to by Merrill, but he says that it agrees in its vegetative characters with Fox's specimen from Penang, which is *N. synandra*, Mast. He describes its fruits (not quite mature) as ellipsoid, 20 x 10 to 12 cm. when dry.

Neesia altissima (Bl) Bl. in Nov. Acad. Cur. XVII (1835) 75 & 83, t. 6; Becc. Malesia III (1889) 261; Bakhuizen in Bull. Jard. Buitz. VI (1924) 221 & 246 (for fuller bibliography and synonymy of this species see this work).

Esenbeckia altissima, Bl. Bijdr. Flor. Ned. Ind. 1 (1825) 119.

Neesia ambigua, Becc. Malesia (1887—1889) 261, t. 31 fig. 1.

Neesia glabra, Becc. 1. c. 263, tt. 30 et 31 figs. 2-4.

N. synandra, Mast. sensu King Mat. Flor. Mal. Pen. in Journ. As. Soc. Beng. LX, pt. 2, (1891) 56, exclusive of reference to Maingay's specimen; Ridley Flor. Mal. Pen. I (1922) 265 pro parte.

PERAK, Sungei Larut (Wray, n. 2271, flrs. in July 1888; n. 2875, small fruits in Aug. 1888); Gopeng (Kunstler, n. 5768, fruits in April 1884); Batu Kurau in Taiping (Haniff, n. 13265, flrs. in May 1924); Tukang Sidin in Teluk Anson (Haniff, n. 14161, young fruits in Sept. 1924); Bagan Serai in Krian, (Mitchell, C.F. n. 5679, flrs. in April and fruits in June of 1922, vern. name Bengang).

Distribution—Lower Siam, Borneo, Java, and Sumatra.

I have taken the name *N. altissima*, Bl., *sens. lat.*, to include the various forms or varieties of this species. Wray n. 2271 has an obscurely 3-5 lobed epicalyx glabrous within except for a thin tomentose ring at base, petals lightly tomentose in the upper half and glabrous in the lower half and along the margins and inside, and glabrous stigma. Haniff's n. 13265 has a deeply trilobed, larger epicalyx tomentose within, petals tomentose outside almost to the base and pilose stigma as in Bakhuizen's specimen n. 5884 cited under *var. typica*, Bakh. *l.c.* 246. The specimen from Lower Siam (Haniff and Nur, n. 3905, from Khaw Poh Hill, flrs. in Dec. 1918) has its epicalyx like Wray's specimen, but the petals and the stigma as in Haniff's specimen. *Neesia* has not been credited for Lower Siam even in Craib's list of the Siamese plants (Flor. Siam. Enum. 1925, pt. I).

Neesia malayana, Bakh. in Bull. Jard. Bot. Buitz. VI (1924) 221 et 247, tt. 34 et 35.

Neesia synandra, Mast. sensu Ridl. Flora of Sing. in Journ. Roy. As. Soc. Str. Br. XXXIII (1900) 51 pro parte; Ridl. Flor. Mal. Pen. I (1922) 265, pro parte.

Singapore, Chan Chu Kang (Ridley, n. 3770, flrs. in 1890); Kranji (Mat. n. 5846, flrs. 1894); near Cluny Road in Tanglin (Furtado, flrs. in Feb. 1924).

Distribution—Sumatra.

C. X. FURTADO.

**ANISOPHYLLEA GAUDICHAUDIANA, Baill. is
A. GRANDIS, Benth.**

About 1823 (the date is unrecorded) George Porter, at one time Head-Overseer of the East India Company's Botanic Garden in Calcutta and then a schoolmaster in Penang, collected in this island and sent to Calcutta a curious plant to which Wallich gave the number 4454 and the name *Strychnos grandis*. But Bentham when he elaborated his account of the Loganiaceae, to which family *Strychnos* belongs, pointed out (Journ. Linn. Soc., 1, 1857, p. 79) that Porter's plant is not even a member of the Loganiaceae, but a species of the genus *Anisophyllea* or *Anisophyllum* in the Rhizophoraceae: and he described it under the name of *Anisophyllum grande*.

In 1836 Gaudichaud collected in Penang specimens of the same plant, and these served as the basis of Baillon's description of *Anisophyllea Gaudichaudiana* (*Adansonia*, 11, 1875, p. 311), a name found in our text books, whereas Bentham's has been overlooked. But Bentham's name long antedates Baillon's, and must be restored as *Anisophyllea grandis*.

Porter collected other specimens of the same plant which Wallich distributed as no. 4976 under another singularly unfortunate name—*Cocculus flavicans*. These specimens are dated 1823. Maingay also collected it; and yet a fifth name, *Anisophyllea grandifolia*, G. Henslow, was bestowed when his specimens were examined for the Flora of British India.

I. H. Burkill.

OBITUARY.

CHARLES CURTIS.

Charles Curtis had charge of the Waterfall Gardens, Penang, from their foundation in 1884 until 1903, when he was obliged to retire through ill health. He died on Aug. 16th, 1928, at the age of 75 years, at Barnstaple, Devonshire.

From 1878 until 1884 he was employed by the firm of James Veitch & Sons as travelling collector, visiting Madagascar, Borneo, Sumatra, Java and the Moluccas. During these years he obtained many fine plants for cultivation, notably *Nepenthes Northiana*, one of the most remarkable of Bornean pitcher plants.

His initial appointment at Penang was that of Assistant Superintendent of Forests, and the Waterfall Gardens was then started primarily as a nursery for economic plants. From the first, however, some ornamental gardening was carried out, and it soon developed into a garden of great beauty, in its naturally beautiful setting. When the administration of Forests passed from the Gardens Department in 1895, Mr. Curtis was able to devote most of his time to the Waterfall Gardens, which remain as a monument of his service. He was a very capable horticulturist, and devoted himself with great energy and enthusiasm to his duties. He was also an active botanical collector, and added considerably to our knowledge of the Malayan Flora. Numerous plant species are associated with his name, and the genus *Curtisina*. He published a list of the plants of Penang Island in the Journal of the Straits Branch, Royal Asiatic Society, no. 25 (1894) and various papers on horticultural topics in the Agricultural Bulletin of the S.S. and F.M.S.

CHARLES FULLER BAKER.

We record with great regret the death of Charles Fuller Baker, Dean and Professor of Tropical Agriculture, College of Agriculture, Los Banos (University of the Philippines), who during a period of leave in 1917 acted as Assistant Director of the Botanic Gardens, Singapore. He died on July 22nd 1927, of chronic dysentery, within a few months of the date fixed for his retirement. He was 55 years of age. Throughout his life he devoted the greater part of his spare time to the accumulation of enormous and very valuable collections of insects and plants (particularly fungi) chiefly from the oriental tropics. While in Singapore he collected numerous insects and fungi, and contributed various short papers to Volume 2 of this Bulletin.

Rainfall.

At the head of the Waterfall Gardens, Penang during the first half of the year, 1927, in inches.

Readings taken at 8 a.m. and credited to the date in which the twenty-four hours begin. Data kindly supplied by the Municipal Commissioners of George Town, Penang.

Date.	Jan.	Feb.	March	April	May	June
1	...	...	·44	·20	·12	...
2	...	...	·04	1·97	·04	...
3	·17	·03	·92	6·05	·03	1·85
4	·03	·03	·56	·26	·14	...
5	·07	...	·36	·11	...	...
6	·11	·09	·30	·10	...	...
7	·97	·06	...	...	...	·02
8	·05	·03	·80	·14	·32	·33
9	1·56	·43	...	2·92	·72	·37
10	·48	...	...	...	·67	·30
11	...	...	...	·15	3·90	·25
12	...	...	...	·03	·88	...
13	...	...	...	·04	·12	...
14	...	·49	·23	·14	·40	·12
15	...	...	·48	2·11	·02	...
16	·21	...	·53	...	·33	·09
17	·04	...	·35	·03	·33	...
18	...	·98	·50	...	...	·57
19	...	·30	...	2·67	...	·72
20	·06	·03	·06	·05	·39	·77
21	...	·06	·05	·47	·35	·02
22	...	·03	·03	...	...	·65
23	...	·14	·03	1·59	...	·07
24	·07	·03	·03	·83	·27	·03
25	·22	·03	·12	·15	...	2·33
26	...	·04	·52	1·15	...	·05
27	·08	·03	·80	1·18	·19	...
28	...	·62	...	·18	·60	...
29	...	...	1·29	·46	...	...
30	...	...	·03	·27	...	...
31	...	...	·48	...	...	...
	3·64	3·45	8·95	23·25	9·82	8·54

Rainfall.

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At the head of the Waterfall Gardens, Penang during the second half of the year, 1927, in inches.

Readings taken at 8 a.m. and credited to the date in which the twenty-four hours begin. Data kindly supplied by the Municipal Commissioners of George Town, Penang

Date.	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	...	25	...	...	2.32	...
2	1.32	10	...	1.28	...	...
3	11	1.20	03	26	09	...
4	97	1.66	46	62	2.48	...
5	48	75	1.41	2.10	1.20	...
6	...	08	16	1.79	30	...
7	1.53	...	13	1.64	...	...
8	03	...	98	06	03	...
9	...	...	...	36	17	2.46
10	03	...	12	41	31	02
11	07	...	74	58	12	55
12	73	...	59	03	...	...
13	23	...	33	...	05	...
14	...	...	...	10	03	04
15	...	...	58	28	...	...
16	...	...	75	02	...	02
17	25	...	90	...	15	...
18	14	2.15	1.08	...	2.55	...
19	21	38	1.28	...	06	...
20	75	1.99	67	1.12	...	02
21	...	24	4.98	...	...	...
22	09	59	05	42	16	...
23	05	03	...	07	13	29
24	...	24	90	66	22	1.78
25	05	32	84	05	...	...
26	...	32	17	64	...	...
27	...	...	63	27	...	...
28	...	...	03	03	...	60
29	...	...	...	08	...	18
30	...	...	1.89	38	63	03
31	04	14	...	1.22	...	1.72
	7.08	10.44	19.76	13.87	11.00	7.71

Rainfall.

At the Botanic Gardens, Singapore, during the first half of the year 1927.
Readings taken at 9 a.m. and expressed in inches.

Date.	Jan.	Feb.	March	April	May	June
1	3.94	2.07	...	.79	.01	...
2	.91	.40	...	.01	.70	...
3	.24	1.22	...	.01	1.60	.01
4	.06	.05	.99	.03	.66	.25
5	trace	.07	3.76	.07	trace	.16
6	.01	.07	.29	trace	trace	...
7	...	trace	.27	...	.57	...
8	.02	...	.31	.06	.03	...
9	.14	...	1.21	.13	1.39	.45
10	.99	.01	.02	.30	...	1.39
11	.03	.31	...	...	...	trace
12	1.27	.12	...	...	.62	.11
13	trace	.15	...	1.64	...	...
14	1.01	.19	...	...	...	...
15	2.35	.03	.11	...	.45	..
16	.06	1.29	...	..	.07	...
17	.18	trace	...	.08	.28	.03
18	trace	...	.21	.14	.20	...
19	1.41		2.89	1.89	...	.05
20	.21	.60	2.01	1.47	1.12	.12
21	.08	.82	.06	.13	.23	.38
22	...	.20	.05	1.27	.13	.04
23	.06	...	1.87	.55	...	.13
24	1.37	.01	.04	.84	...	trace
25	.01	...	.06	.89	.03	.37
26	...	.01	...	.16	.02	.15
27	trace	.95	trace	...	.21	.94
28	1.68	2.40	.09	.06	...	trace
29	.62	..	...	1.72	.76	...
30	.03	...	.41	.68	...	...
31	1.64	...	2.15	...	...	...
	18.32	10.97	16.80	11.83	9.14	4.58

Rainfall.

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At the Botanic Gardens, Singapore, during the second half of the year 1927.
Readings taken at 9 a.m. and expressed in inches.

Date.	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	...	trace	...	2.45	...	.09
2	.02	...	.02	.40	1.15	.24
3	1.31	.13	.08	.20	.20	.08
4	.06	...	trace	.91	...	.06
5	.52	...	1.31	trace	.50	.01
6	.10	.11	trace	.50	.31	.09
7	.01	.07	..	.17	.08	trace
8	.13	...	...	.56	1.13	.01
9	.04	...	...	.36	.71	...
10	.89	...	...	...	trace	...
11	trace	...	...	...	3.18	1.52
12	.03	.27	.14	...	trace	.59
13	...	...	.03	.01	.02	.21
14	...	.01	...	..	.01	.07
15	...	trace	...	.11	.27	...
16	.29	.02	...	...	trace	.15
17	.41	trace	.44	...	.13	...
18	.07	...	...	...	.01	.01
19	...	...	.09	...	.05	trace
20	.10	.92	...	...	.04	.08
21	...	.19	.03	trace	.13	.02
22	...	1.46	.46	.16	...	.04
23	...	1.31	.07	...	.07	.49
24	...	trace	.54	trace	.99	2.59
25	...	.04	.06	.22	.13	.01
26	...	...	1.22	.34	.12	3.67
27	...	.80	.36	.70	.01	.51
28	...	.04	.02	.01	...	.57
29	...	...	...	.03	.04	.22
30	...	...	.78	.35	trace	trace
31	...	..	...	.49	..	.02
	3.98	5.37	5.65	7.97	9.28	11.35

Summary of Rainfall 1927.

	SINGAPORE.				PENANG.			
	No. of rainy day	Amount of Rain.		Longest spell without rain.	No. of rainy days.	Amount of Rain.		Longest spell without rain.
		Inches.	mm			Inches.	mm	
Jan.	28	18·32	465	1 day	14	3·64	92	5 days
Feb.	22	10·97	279	2 days	18	3·45	88	4 ..
Mar.	20	16·80	427	4 ..	23	8·95	227	5 ..
April	23	11·83	300	3 ..	25	23·25	590	1 ..
May	21	9·14	232	2 ..	19	9·82	249	3 ..
June	18	4·58	116	4 ..	17	8·54	217	4 ..
July	15	3·98	101	11 ..	18	7·08	180	5 ..
Aug.	17	5·37	136	4 ..	16	10·44	265	11 ..
Sept.	18	5·65	143	5 ..	24	19·70	500	2 ..
Oct.	21	7·97	202	5 ..	25	13·87	352	3 ..
Nov.	26	9·28	236	1 day	18	11·00	279	5 ..
Dec.	27	11·35	289	2 days	12	7·71	196	8 ..
Total.	256	115·24	2926		229	127·25	3215	

Greatest amount in 24 hours 3·94"
or 100 mm.

Greatest amount in 48 hours 4·90"
or 124 mm.

Greatest amount in 72 hours 6·27"
or 159 mm.

6·05 inches or 154 mm.

8·02 inches or 204 mm.

8·28 inches or 210 mm.

Periods in which more than 5 ins. fell in 72 hours. 3 (Jan. Mar. Dec.)

4 (April, May, Sept., Oct.)

Periods in which less than ·02 ins. fell in 120 hours. 6 (May-June, July, Aug.-Sept., Oct. (2)).

9 (Jan., Jan.-Feb., March, May-June, June-July, Aug., Nov., Dec.)

Relative Humidity of the air at the Botanic Gardens, Singapore. from wet and dry bulb hygrometer readings made daily at 9 a.m. during the year 1927.

Date.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dce.
1	95	100	73	81	83	81	85	79	81	100	77	72
2	80	81	76	77	91	79	75	73	72	95	91	76
3	93	93	76	79	95	80	95	75	79	78	78	80
4	74	90	83	90	85	95	98	75	76	91	83	73
5	76	82	91	81	78	83	98	81	100	78	92	86
6	86	83	87	83	83	76	80	83	81	90	83	86
7	76	75	77	83	98	83	75	89	70	98	68	79
8	75	71	87	86	85	79	95	75	84	71	87	82
9	70	79	91	76	90	91	81	68	79	91	100	67
10	90	83	79	91	73	93	98	72	64	65	72	83
11	67	82	85	81	71	72	79	70	72	74	98	83
12	86	75	79	83	84	93	87	75	81	70	79	85
13	73	75	74	81	70	81	83	79	77	74	79	95
14	75	75	68	71	83	79	85	76	75	77	83	93
15	76	84	68	78	87	74	81	76	70	79	75	79
16	86	79	73	76	90	76	83	76	69	66	74	68
17	82	72	75	79	83	73	95	72	89	70	72	84
18	71	72	76	77	79	68	81	72	71	67	93	79
19	77	76	87	83	79	79	79	75	77	69	91	76
20	77	87	74	97	83	95	79	95	76	72	93	86
21	75	95	75	72	76	91	83	89	79	65	95	72
22	82	74	83	98	79	91	79	97	95	72	62	74
23	82	75	76	83	83	95	79	86	75	81	76	95
24	84	75	91	85	72	81	81	82	79	75	97	84
25	86	70	84	77	87	95	79	86	82	72	89	85
26	87	83	70	76	87	71	79	75	93	70	91	95
27	79	76	74	79	91	85	77	95	95	85	80	74
28	95	87	83	83	79	75	76	79	83	75	71	89
29	78		72	98	77	76	76	83	72	76	79	86
30	80		67	87	80	76	79	75	72	76	66	79
31	95		81		76		76	68		77		72
	80.8	80.2	78.5	82.6	82.4	82.2	83.2	79.0	78.9	77.3	82.5	81.4

Average for the year 80.7

CORRIGENDA in the Gardens Bulletin Vol. IV Nos. 2 & 3.

- p. 51, line 10, *for* 11912 *read* 11910
- p. 56, line 20, *for* 17210 *read* 17310
- p. 58, line 8 from bottom, *for* 9 cm. *read* 9 mm.
- p. 68, line 13, *for* found *read* founded
- p. 69, line 8, *for* Denstaestia *read* Dennstaedtia
- p. 69, line 17, *for* Odontosoris aculata *read* Odontosoria aculeata
- p. 77, line 6 from bottom *for* exclusively *read* extensively.
- p. 78, line 18 *for* as Tanjong Malim *read* at Tanjong Malim
- p. 87, *delete all except:* A fruiting spike of Disoscorea tamarisciflora, nat. size.

CORRIGENDA in the Gardens Bulletin Vol. IV Nos. 4 & 5.

- p. 114, line 15, *delete the words* the data on which are repeated.
- p. 116, *under* ARDEN, Stanley, *read* (1900—1906) *for* (1900—190).
- p. 118, *under* BURN-MURDOCH, Alfred M. *read* (1868—1914) *for* (1868—1919)
- p. 120, *for* DOCTORS van LEEUWEN, W. *read* DOCTERS van LEEUWEN, W.
- p. 120, *for* DURNFORD, *read* DURNFORD, J.
- p. 124, *for* HOBSON, *read* HOBSON, S.G., *and in the next line substitute the words* Posts and Telegraphs *for the word* Survey
- p. 125, *for* ICHEBESTA, Rev. Father *read* SCHEBESTA, Rev. Father Paul
- p. 125, *for* JUPP, *read* Jupp, John.
- p. 125, *for* KELSALL, Colonel J. H., *read* KELSALL, H. J., *and in the next line substitute the word* Artillery *for the word* Engineers.
- p. 126, *for* LEDOUX, J. A. *read* LE DOUX, J. A.
- p. 127, *after* LOW, Sir Hugh, *add* (1824—1905).
- p. 128, *under* "MAT," *for* Beeker *read* Becher.
- p. 128, *under* MOORHOUSE, S.W., *for* 1903—190, *read* 1903—1905.
- p. 128, *insert* MARTENS, Eduard von,
A zoologist attached to the Prussian Expedition to East Asia of 1860—1863, son of Professor Georg von Martens for whom he collected sea-weeds. Those which he collected in the harbour of Singapore in March, 1862, were enumerated in "Die preussische Expedition nach Ost-Asien, Die Tange," Berlin, 1866.

